AGRICULTURAL INFORMATION NETWORKS OF FARM WOMEN AND ROLE OF AGRICULTURAL EXTENSION: THE CASE OF DALE WOREDA, SOUTHERN NATIONS, NATIONALITIES & PEOPLES' REGION

M.Sc. Thesis

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AGRICULTURAL INFORMATION NETWORKS OF FARM WOMEN AND ROLE OF AGRICULTURAL EXTENSION: THE CASE OF DALE WOREDA, SOUTHERN NATIONS, NATIONALITIES & PEOPLES' REGION

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By
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As Thesis Research advisor, we here by certify that we have read and evaluated this thesis prepared, under our guidance, by Deribe Kaske Kacharo, entitled Agricultural Information Networks of Farm Women and Role of Agricultural Extension: The case of Dale *Woreda*, Southern Nations, Nationalities & Peoples' Region. We recommend that it be submitted as fulfilling the Thesis requirement.

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DEDICATION

I dedicate this thesis manuscript to my mother ABEBECH WOGASO, whom I lost in 2004, for nursing me with affection and love and for her dedicated partnership in the success of my life.

STATEMENT OF AUTHOR

First, I declare that this thesis is my bonafide work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements of M. Sc. degree at the Haramaya University and is deposited at the University Library to be made available to borrowers under rules of the Library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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BIOGRAPHICAL SKETCH

Deribe, the author was born on June 5, 1961 in Southern Nations Nationalities and Peoples' Region (SNNPR), Wolaita Zone, Damot Gale *Woreda* to his mother Abebech Wogaso and his father Kaske Kacharo. He attended his elementary and junior education at Boditi junior secondary school. He also attended his High-school education at Soddo Comprehensive Secondary school. Then joined the then Debre-Zeit Junior College of Agriculture and graduated with Diploma in Crop Production and Protection Technology (CPPT) in July 1983.

Soon after his graduation, he was employed by the Bureau of Agriculture of the then Sidamo Administrative Region and served for about 15 years. Then he joined the then Alemaya University in 1999 academic year and graduated with B.Sc. degree in Agricultural Extension in July, 2001. After that he assigned and has been working in SNNP Region Bureau of Agriculture and Rural Development. Then after, he re-joined Haramaya University in 2005 to pursue graduate studies for the M.Sc. in Rural development and Agricultural Extension. The author is married and has two children.

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LIST OF ABBREVIATIONS

AKIS	Agricultural Knowledge & Information System
ATVET	Agricultural Technical & Vocational Education Training
AU	Alemaya University
BOA	Bureau of Agriculture
CI	Condition Index
CSA	Central Statistical Authority
CTA	Technical Centre for Agricultural and Rural Cooperation
DA	Development Agent
FAO	Food and Agricultural Organization
FTC	Farmer Training Center
HU	Haramaya University
ICT	Information & Communication Technology
IPMS	Improving Productivity & Market Success
Masl	Meter Above Sea Level
MOA	Ministry of Agriculture
MoARD	Ministry of Agriculture & Rural Development
MLR	Multiple Linear Regression
NGOs	Non-Governmental Organizations
PA	Peasant Association
PADETS	Participatory Demonstration and Training Extension System
PLW	Pilot Learning Woreda
RAAKS	Rapid Appraisal of Agricultural Knowledge Systems
SMS	Subject Matter Specialist
SNNPR	Southern Nations, Nationalities & Peoples' Region
SPSS	Statistical Package for Social Science
T&V	Training & Visit
TOT	Transfer of Technology
FHH	Female-Headed Household
MHH	Male-Headed Household

VIF	Variance Inflation Factor
WOoARD	Woreda Office of Agriculture & Rural Development

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AGRICULTURAL INFORMATION NETWORKS OF FARM WOMEN AND ROLE OF AGRICULTURAL EXTENSION: THE CASE OF DALE WOREDA, SOUTHERN NATIONS, NATIONALITIES & PEOPLES' REGION

ABSTRACT

Ethiopian rural women make significant contribution to agriculture and are the mainstay of the farm labor. They work in all aspects of agriculture. In addition to their active engagement in agriculture, women are responsible for all household chores. Despite their immense contribution to the agriculture, rural women often face difficulties than men in gaining access to agricultural information. The Ethiopian agricultural extension system suffers from a number of weaknesses in its services for rural women. There is, therefore, an alarming need to improve agricultural extension work with the rural women. Therefore, this study is intended to analyze the agricultural information network of farm women; to identify factors influencing farm women's information network output and to identify the constraints and opportunities of extension services in reaching out to women in Dale Woreda, Sidama Zone, SNNPR. Three stages sampling were used in which both non-random sampling and random sampling procedures was followed to select four Peasant Associations and 160 respondents. Structured interview schedule was used for collecting the essential quantitative data from the sampled respondents. To generate qualitative data, field observations; informal interview with key informants; discussion with separate focus groups of women and men farmers were conducted. The quantitative data were analyzed using descriptive statistical tools and also χ^2 *= test, Cramer's V, Pearson's Correlation coefficient & Multiple Linear Regression were employed. The result of the study shows that, neighbors or friends are the major and the most important source of information for the farm women. The major output of the study indicates that knowledge of dairy farming practice of women farmers was significantly influenced by communication skill, interpersonal trust, social participation, total annual income, extension participation, empathy of respondents and access to credit. The major constraints identified in agricultural information network of farm women were low participation of women in extension programs; poor access to credit; absence of market information and alternative market for products; extension methods contribute less as source of information. Therefore, it is recommended that, the extension system operating in the area, need to be strengthened further to increase the flow of information to women for rural transformation.*

1. INTRODUCTION

Over 85% of the population in Ethiopia live in the rural areas and depend on subsistence agriculture. Ethiopian rural women make significant contribution to agriculture and to ensure food security and are the mainstay of the farm labor. A major chunk of women's labour force in production system is invested in weeding, harvesting, household animal care, marketing, post harvest handling etc. (Ranjan and Hedija, 2004). Harrowing and weeding, in particular, are considered as women's activities. Women are also active in livestock production.

In addition to their active engagement in agriculture and livestock production, women are responsible for all household chores, mainly as a result the gender division of labor. As a consequence of this, rural women in Ethiopia are engaged in laborious tasks for not less than 15-18 hours a day, often without any cash remuneration, recognition or appreciation.

Despite their immense contribution to the household economy and given their critical role in determining and guaranteeing food security as food producers, food providers and contributors to household nutrition and security, rural women often face difficulties than men in gaining access to agricultural information to increase their production and productivity (Winrock, 2001).

According to Habtemariam (2004), the extension system in Ethiopia has a relatively longer history than many other Sub-Saharan African countries. It has also enjoyed increasing government support over years, though not to the level expected. Though it increased its staff substantially to expand coverage, there is not much change in the way extension activities are planned, implemented and evaluated. Review of the evolution of the Ethiopian extension system under different political systems reveals the significance of prevailing policies and development strategies on the contribution that extension could make to agricultural development.

Any extension system must target particular categories of clients to meet their needs efficiently (Saito, 1990). The range of women's tasks and activities in agricultural production is much wider than that of men – the extension service, being predominantly run by and composed of men, needs improvement to understand women's production system and to view farm business and household economies from the women's stand point (Saito and Daphne, 1992).

Women form a large segment of the agricultural workforce. As such, they deserve increased attention of agricultural extension services in every developing nation. There is a need for an action-oriented plan to reach the millions of women in agriculture who fill the bread baskets of the third world and contribute to their exports (Das, 1995).

Female farmers are not considered and their agricultural activities and/or issues concerning them have been the last priorities in the country's agricultural research agenda, and so lacked improved extension packages and services that assist them to improve their productivity. So far the extension system in Ethiopia has not been able to address the cultural taboo against the participation of female farmers in ploughing and sowing, which subsequently reduce the rigid division of labor both at the household and field level. There is a lack of concern about the multiple roles of female farmers while doing research on identifying the priority problems and developing extension systems that are appropriate to the farm family's life cycle stages. Little efforts have been made to address and reduce the heavy burden of work that female farmers face. Often it is observed that major emphasis in agriculture is given to men's activities while the role of women and children in the Ethiopian farming systems has been ignored. Married women in particular are by-passed in the transfer of improved agricultural technologies assuming that they will get the information through their husbands (EARO, 2000).

Without due attention for development of the majority of the women farmers, it is unlikely that Ethiopia will be able to feed her people, to develop its agro-industries, to provide adequate employment, to sustain or improve current level of foreign exchange earnings (Chimdessa, 1998).

Increasingly, knowledge/information becoming one of the most important factors of production, and there is no doubt that this trend will intensify. In this century, it is knowledge accumulation and application that will drive development and create unprecedented opportunities for economic growth and for poverty reduction. It has been estimated that the effective integration of information and communications technologies (ICTs) in different sectors of the economy will augment economic growth rates by 2-3%.

Having timely and relevant information can fundamentally alter people's decision-making capacity and is critical to increasing agricultural productivity. Information on new plant and animal management practices, pests and diseases, transport availability, new marketing opportunities, and the market prices of farm inputs and outputs is fundamental to an efficient and productive agricultural economy.

Yet, 'information poverty' is common in rural areas in Africa. It is often difficult for rural people to obtain relevant and timely information. Distance to the information source can be considerable, and poor transport and communications infrastructure make access to information difficult. Also, such information is often in written form, limiting its access for the many women who have limited literacy. It is also difficult for rural communities to share information beyond face-to-face contact, thus inhibiting access to information available outside their locality. Equally important, indigenous knowledge is seldom documented and stored, and thus ultimately is lost.

Women in the agricultural sector in eastern and southern Africa already face many socio-economic, educational and legal obstacles in realizing their full potential. They also lack appropriate and usable information that could help them with their farming activities. They need information on a wide range of subjects, including agricultural production, processing, marketing, trade laws and the natural resource base. They also need to exchange indigenous knowledge, and they require access to ICTs to obtain information efficiently and cost-effectively (CTA, 2002).

The potential of livestock to reduce poverty is enormous. Livestock contribute to the livelihoods of more than two-thirds of the rural poor and to a significant minority of the peri-urban poor (Holmann *et al*, 2003). There is also considerable evidence which shows that the rural poor and the landless get a higher share of their income from livestock than do better off people (Delgado *et al*, 1999, cited in ESAP, 2000). For many people dairy production is the most important income generator.

Dairying provides a regular income to farmers in different parts of Ethiopia. Different authors confirmed that the smallholders' dairy package production system is a powerful means of raising farm incomes and welfare (Hailemariam, 1995; Berhanu, 2002; Ahmed *et al*, 2003). To improve the present traditional livestock management, knowledge/information is vital as in the case of crop production system.

The study was conducted in Dale *Woreda,* Southern Ethiopia. The cattle in the study *Woreda* are local cows and crossbred dairy animals. Dairy production is mainly based on local Zebu cows in rural areas and on crossbred (Zebu x Friesian) cows around urban areas (IPMS, 2005). Dairy production is one of the major areas of activities where women farmers participate.

About 80% of the dairy cows are found in urban and peri-urban areas (coffee/livestock system) in the study area. Emphasis in this system is on milk production. Between 1987 and 1995 the Smallholder Dairy Development (SDD) Project of the Ministry of Agriculture supported by FINNIDA was implementing a dairy development program in Awassa Zuria, Shebedino and Dale *Woredas*. A number of farmers benefited from the project through purchase of crossbred dairy animals, forage development, artificial insemination and bull station services, animal health services, and milk marketing through formation of milk units with some milk processing facilities, training and other related activities. Besides the production of milk, manure production for nutrient cycling is important for the coffee/livestock based production system. Animals are mainly tethered around the homestead and cut and carry feeding system is practiced (IPMS, 2005).

According to the result of pilot learning site diagnosis and program design conducted by IPMS in the study *Woreda* (District), inadequate knowledge on dairy management is an important issue among the different issues which need to be addressed. To improve the capturing and sharing of knowledge on dairy management in the PLW, the agricultural information networks of farm women, who are important actors in the sector, has to be explored.

1.1. Statement of the problem

Women account for 50 percent of the population. Women are the main work force in most rural Ethiopia where economy depends on agriculture (Negatwa, 2006).

Women in Ethiopia are engaged in various economic activities including land cultivation and harvesting, food processing, marketing, gardening, construction of housing, and animal husbandry. By doing so, women provide approximately 40% of the family labour (Habtemariam, 1996).

Studies in Ethiopia also indicate that women spend a great portion of their time fetching water and collecting firewood, in addition to feeding children, taking care of the family and other household chores (Winrock, 2001).

The agricultural extension service in the country is male dominated and predominantly oriented towards advising and working with male farmers of the households (Ngatwa, 2006). Women are typically, and wrongly, still characterized as "economically inactive." Agricultural extension services still do not attach equal importance to reaching women farmers or women on the farm (Habtemariam, 1996).

Development planners have assumed that information given to male farmers will be passed on to other farming members of the household. This does not often happen. Experience indicates

that agricultural knowledge acquired by male, unless they themselves will benefit, often does not “trickle across” effectively to women in the family (Saito and Daphne, 1992).

Policy makers and administrators typically still assume that men are the farmers and women play only “supportive role” as farmers’ wives. This attitude by both planners and implementers has significant adverse effects on women’s access to agricultural extension services (Habtemariam, 1996).

The Ethiopian agricultural extension system suffers from a number of weaknesses in its services for rural women. There is therefore an alarming need to improve agricultural extension work with the rural women.

Information is said to be a resource that must be acquired and used for the improvement of agricultural production. The sharing of ideas and information forms a large part of extension agents’ job. Having adequate well-presented information will improve the efficiency of rural development projects and programmes (Samuel, 2001). According to Asres (2005), information facilitates the individual to be more rational, increase the decision making abilities and improve the standard of life. Using information is a key issue in information age. The real challenge of our time is not producing information or storing information, but getting people to use information.

So far, no study has been conducted in Southern Ethiopia on agricultural information flow to farm women in relation to their access and utilization for crop and livestock packages. This study addresses this research gap and tries to make empirical inferences to help planners and extension administrators as well as future researchers.

1.2. Objectives of the study

The specific objectives of the study are:

1. to analyze the agricultural information networks of farm women;
2. to identify factors influencing farm women's information network output in terms of knowledge, and
3. to identify the constraints and opportunities of extension services in reaching out to women.

1.3. Scope and Limitation of the study

The study was limited to only one selected *Woreda* in SNNPR. Since the study was limited by time, financial constraints and human resources, there could have been some bias in the information obtained about agricultural extension services.

The study focuses only on the agricultural information network of farm women and is limited to sources of data on the subject.

Given the diversity of the Ethiopian population in terms of religion, ethnicity, agro-ecological climate, the communities selected are not representative of all the people in Ethiopia. As such, the research does not claim to provide conclusive findings on agricultural information network of farm women and role of agricultural extension in Ethiopia. However, the research finding could be used to raise awareness among different stakeholders and also serve as background information for others who seek to do further related research and would help serve in formulating and revising agricultural extension strategies in the region as well as other areas with similar socio-economic conditions.

1.4. Significance of the study

To support women's extensive and multifaceted roles in agriculture and to enable them to respond to market incentives more efficiently, women need effective agricultural extension services.

The result of this study will help to understand the flows and network of agricultural information, information sources that rural women use, factors influencing farm women's information network output and the different constraints and opportunities of extension service in reaching out to women. The findings of this study can also be used in guiding policy makers and development planners who are concerned about gender issue while designing agricultural projects within the region and elsewhere in the country.

1.5. Operational Definitions

Personal Characteristics: includes the variables related to personal characteristics such as age, marital status, level of education, communication skill, family size and practice of sharing the information with others.

Socio-economic Factors: this refers to the position of the women farmers in society, which is determined by various social and economic variables such as income, size of land holding and radio ownership.

Situational factors: includes the variables of the surroundings influencing women's access to agricultural information such as the extent of social participation, information seeking behavior, cosmopoliteness, access to credit and extension participation.

Psychological factors: includes the variables of psychological dimension of individual respondent such as achievement motivation, level of aspiration, interpersonal trust, positiveness, empathy and attitude of women farmers towards DA.

Network: The formal and informal relationships between women farmers and actors in the study area in relation to flows of agricultural information.

Knowledge of farm women on dairy farming practices: knowledge is defined in Webster's dictionary as "acquaintance with facts, range of information, awareness or understanding, the body of facts, principles, etc. accumulated by mankind as far as one knows within the range of one's information". Knowledge, as defined in the present study, includes "those behaviors and test situations which emphasize remembering by recall of ideas, material or practices."

2. REVIEW OF LITERATURE

The literature review is divided into three main sections and sub-sections. In the first section, the theoretical background that deals with the agricultural extension and information is presented. In section two, agricultural extension and women farmers and in section three, conceptual frameworks of the study are presented.

2.1. Agricultural Extension and Information

2.1.1. Definition of Agricultural Information

Samuel (2001) defined agricultural information as the data for decision-making and a resource that must be acquired and used in order to make an informed decision.

Umali (1994) classified agricultural information into two broad groups: pure agricultural information and agricultural information inherently tied to new physical inventions. Pure agricultural information refers to any information which can be used without the acquisition of a specific physical technology. It includes all types of self-standing advice on practices such as production techniques, farm management, marketing and processing and community development. On the other hand agricultural inventions or technologies are those that come in the form of agricultural inputs, management technologies facilitating farm management, and marketing and processing equipment.

In the light of the above definitions, in this study the researcher conceptualized the meaning of agricultural information as both agricultural messages via extension and agricultural information that is embodied in agricultural technologies and transferred between the actors in the agricultural extension system.

2.1.2. The Concept of Information flow

The concept of knowledge-sharing is defined as the transfer of useful know-how or information. People have investigated multiple types of flows (e.g. the material flow, the energy flow, the message flow, control flow, etc.) and the rules they follow in respective domains.

The knowledge flow (sometimes called information flow) is the flow of knowledge through an organization. It is decomposed into atomic knowledge flow from one knowledge repository to another. The knowledge flow looks like what is best known as workflow. The main difference is that workflow is task-driven although knowledge flow is content-driven. In fact, a workflow is a coordination and control diagram and knowledge flow is a communication diagram. However, coordination requires information exchange and thus most of the workflow models contain the knowledge flow. The reverse does not generally hold.

Knowledge represents a critical resource in the modern enterprise—so critical that it is now being conceptualized as central to competitive advantage in a knowledge-based view of the firm. But knowledge is not evenly distributed through the enterprise. Capitalizing on this resource for enterprise performance depends upon its rapid and efficient transfer from one organization, location or time of application to another. From a technological perspective, such dynamic dependence points immediately to the design of information systems —along with corresponding organization and process characteristics -to enhance knowledge flow. According to Nissen and Levitt (2002), knowledge is distinct from information and data, and few extant information systems even address *knowledge* as the focus or object of flow. Indeed in this light, the IS field does not have the benefit of strong theory on knowledge flow, as Nissen and Levitt (2002) note; there exist "large gaps in the body of knowledge in this area." So how does knowledge flow through the modern enterprise, and what kinds of managerial interventions can be made to enhance the flow of knowledge? A number of theoretical models have been developed to describe various aspects of the knowledge-flow phenomenon but few provide insight into the phenomenon itself.

If everyone needs information, how does this information actually flow at the grassroots level to influence the development process? Community members build their capacity for integrating information and knowledge into their various development activities. Such capacity empowers people to solve intelligently the problems that exist in their community.
The spread of new information (also called innovative ideas) in society follows a four-step process: the awareness stage; the interest stage; the examination and testing stage; and the adoption/rejection stage.

In this first stage, individuals in the community get information on a new idea or useful practice. This new information creates an environment that allows people to start thinking about the new practice. The first stage implies that the information is provided in such a way that people are able to understand the new idea/practice. They understand the language, format, and the steps in adopting the idea/practice. It is easier for members of the community to receive new ideas, if they have access to a variety of information sources, such as newspapers, radio, books, the Internet, and training workshops. It is more difficult to receive new ideas, if the community does not have access to such information sources.

If the new practice is attractive because it addresses a need in the life of an individual or community, people may start to develop an interest in it. They will try to find out more about the idea/practice. This may lead to a search for more information. Those seeking more information become excited and interested. They stimulate the rest of the community. Conversation and discussion play an important role at this stage, especially communication from relatives, neighbours, extension agents, and social networks. Together these groups raise interest in the innovation. This communication shapes and influences opinions on development issues in the community.

In third stage, the idea that passes the interest stage is tried out on a small scale. There is some evaluation and consultation to see whether the idea/ practice is worth trying out.

After the three stages have been completed, a decision may be taken to adopt or reject the new idea/practice. Some of the factors to influence the decision are: income levels, risk and community priorities.

Self-confidence is important if individuals are to successfully adopt a new behaviour or implement a new practice. If self-confidence is lacking, it is hard to adopt a new idea/practice. Successful role models set a good example. People not only learn through their own experience, but also by imitating the behaviour of other individuals who have succeeded in doing something new. Good leaders, who encourage and reassure people about what they can achieve if they work together in the community, are extremely important in a community taking on challenging development tasks.

New ideas/practices are likely to be adopted if they have the following characteristics: a) Relative advantage b) Compatibility/suitability c) Complexity d) Observability

The process of adopting new ideas can be speeded up through the participation of members of the community. They will then know what to adopt. It will be easier to decide. They will feel free to express their knowledge and information needs, and other needs they have, to build capacity to deal with the expected social changes. Wider participation by members of the community may also help in identifying other structural limits that prevent the adoption of new practices. Examples of limits, for example, are the shortage of: land, financial resources, transport, and marketing information. The community can then address these problems in order to support the adoption of new ideas and practices (Mchombu, 2004).

2.1.3. Information-seeking behavior

Information seeking behavior is a broad term encompassing the ways individuals articulate their information needs, seek, evaluate, select, and use information. In other words, information-seeking behavior is purposive in nature and is a consequence of a need to satisfy some goal. In the course of information seeking, the individual may interact with people,

manual information systems, or with computer-oriented information systems. According to Pettigrew (1996), information-seeking behavior involves personal reasons for seeking information, the kinds of information which are being sought, and the ways and sources with which needed information is being sought. Barriers that prevent individuals from seeking and getting information are also of great importance in understanding the information-seeking behavior of individuals and organizations.

Information use is a behavior that leads an individual to the use of information in order to meet his or her information needs. Information use is an indicator of information needs, but they are not identical. As Line (1973) pointed out, individuals do not use all the information they seek (partly because they are not always able to obtain what they need, partly because the materials may not be relevant when they obtain them, and partly because individuals sometimes do not know what they need). In addition, sometimes, individuals do not seek all the information they intend to use.

Knowledge about the information-seeking behavior and information use of individuals is crucial for effectively meeting their information needs.

According to Shin and Evans (1991), the main reason for seeking information by Illinois agriculture and horticulture Extension advisors was to answer client inquiries. In their study, they categorized information sources into three types: oral, written and electronic. Written-only sources accounted for the largest single share (45.9%), followed closely by written and oral combination (43%). Less than three percent used electronic information sources. Radhakrishna and Thomson (1996) found that extension agents regularly seek information to carry out their day-to-day work. Extension agents frequently communicate with a variety of information sources. Prominent among these were: clients, another agent in the office, another agent in another county, extension specialists, their immediate supervisor, local news agencies, local business organizations, state and federal agencies, and local school teachers and administrators.

Gholamreza and Naser (2005) investigated the factors influencing information-seeking behaviour of Extension workers in Zanjan Province, Iran. His research showed that there was a significant relationship between age, level of education, years of experience, and the worker's level of job-related information with information-seeking behaviour. The main reason for seeking information by extension workers was holding training courses, followed by solving daily problems of farmers and up-dating their information, respectively. According to Gholamreza and Naser (2005), Provincial Extension Specialists who were working for the Ministry of Jihad-e Sazandegi reported radio, TV, computer, seminars and training courses as their five most used information sources and channels. They indicated the lack of knowledgeable and skilled information personnel as the main problem of the information system of the Ministry of Jihad-e Sazandegi in Iran.

2.1.4. Intra-household Transfer of Agricultural Information

According to Saito and Daphne (1992), development planners have assumed that information given to male farmers will be passed on to other farming members of the household. This does not often happen. Experiences indicate that agricultural knowledge acquired by male, unless they themselves will benefit, often does not “trickle across” effectively to women in the family. Especially in polygamous household, men are usually not expected to share information and it would be considered improper for a wife- especially a junior wife- to ask her husband what he learned from the extension agent that day.

Men are less likely to pass information along to women when crops or tasks are gender-specific. In Malawi, for example, wives of men in agricultural extension groups said their husband rarely passed advice on to them. If they did, the women had difficulty understanding the secondhand advice or did not find it relevant to their needs. Even when men are willing to share information with their wives, they may simply not be familiar enough with an agricultural operation or crop to share the information effectively. Mahapatra (1987), explains that, in India, women learned of extension messages-“some in a clear way and others not so

clear"- through indirect channels of communication such as husbands, neighbors and other villagers. However, this indirect effect of the extension system on women did not significantly change production. The challenges to any extension service is how best to communicate with the prime actors in the agricultural activity.

2.1.5. Agricultural extension and information

Schiefer (1992), defined agriculture as any production-oriented economic activity, which aims at the production and processing of agricultural products, involving two closely interconnected flows of:

- Material goods (including production inputs, agricultural products, etc.) and
- Information (in whatever form).

However, traditionally agricultural projects and researchers had paid too little attention to agricultural information.

According to Samuel (2001), information has been identified as one of the resources required for the improvement of agricultural production. It is defined as the data for decision-making. It is said to be a resource that must be acquired and used in order to make an informed decision. Those who possess appropriate and timely information will make a more rational decision than those without.

Agricultural information system should be the basic component of extension institutions' task and must be incorporated into their long and short term plans.

Having adequate well-presented information will improve the efficiency of rural development projects and programs. It will improve the implementation of rural projects and programs through improving capacity of managers to devote due consideration to the principles of rural development programs: accessibility, independence, sustainability, participation, effectiveness and vision (Samuel, 2001).

2.1.6. Generation and use of agricultural information

According to Samuel (2001), communication defined as the sharing of ideas and information, forms a large part of extension agents' job and hence of extension institutions. Extension agents must also be able to communicate with superior officers and research workers about the situations faced by farmers to effect and result in their intervention.

The responsibility and the role played by agricultural extension institutions in rural development demand them to establish an information system of similar size and scope. Information and its dissemination is also a subject of considerable importance to rural population who commonly suffer from isolation and have difficulties in communicating their priorities to decision makers. Consequently it is imperative to find approaches, which can get messages over them as well as means for them to communicate their problems and aspirations.

There are different generators and users of agricultural information. Aina *et al* (1995), categorize the various agricultural information user populations as follows:

- Policy makers and planners
- Researchers
- Extension staff
- Educators and students
- Agro-base industries and services staff, and
- Farmers.

Each of these sectors contributes directly to the improvement of agriculture and hence relevant information provided to each category of these users population will contribute to the development of agriculture.

Aina *et al* (1995), defined agricultural information as all published and unpublished knowledge of agriculture and broadly categorized into four classes: Technical/Scientific information, Commercial information, Social and cultural information and Legal information.

Information is power. Using information is a key issue in the information age. The real challenge of our time is not producing information or storing information, but getting people to use information. Information is a critical resource in the operation and management of organizations. In extension organization, like other organizations, information has its own importance to the individuals who are working in managerial or any other positions in the organization to make right decisions. Furthermore, because communicating information and knowledge from information resources or developers to extension clientele is an integral part of the extension process, the flow of information in extension organizations is of more importance than in organizations that are not responsible for providing their clients with useful information. In the information age, extension has a major role in pointing the way to increasing the use of knowledge and information through its people orientation.

As Buford (1990) pointed out, agricultural extension depends to a large extent on information exchange between and among farmers on the one hand, and a broad range of other actors on the other hand. Extension, along with education and research is typically seen as a service, public or private, that responds to the needs of farmers and rural people for knowledge that they can use to improve their productivity, incomes and welfare and to manage the natural resources, on which they depend, in a sustainable way. It brings information and new technologies to farming communities, allowing them to improve their production, incomes and standards of living. Considering this situation, extension has little choice but to become information-based.

2.1.7. The role of information and human Development

Regarding the role of information in modernization model of development, the thinkers of the 1960s thought that “underdeveloped countries” must transform their weak and culturally backward societies to become “developed”, like Western capitalist societies. It was believed that the main cause of underdevelopment lay in the backward culture of societies in developing countries (Mchombu, 2004). The solution to underdevelopment, therefore, was to

change the attitudes of people in underdeveloped countries. Therefore, people forced to cast off their culture, which was believed to be fatalistic. According to Mchombu (2004), to produce the change from underdevelopment to development, information needed to be communicated to peasants and small farmers through the mass media. It was believed that radio, newspapers, television and books would change their culture, attitudes, and the traditional way of life.

Modernization-driven information services provide direct access to information only to powerful groups in society. The information is then expected to trickle down to the majority at a later stage. In this top-down model of development, information on development issues does not flow directly to everyone in the community.

Since the 1980s, an alternative development approach people-centered development approach began to be used. This approach recognizes the importance of the well being of all the people.

The role of information services in the people-centred or human development approach is very different from the modernization or economic growth model of development. Some of the major differences are:

a) Access to information is for all groups in the population (including women, youth, and rural and urban poor people);

b) Information is a tool and access to information is a process for building self-reliance, empowerment, civil society, participation and gender equality;

c) Indigenous or traditional knowledge and locally-generated information are given high status;

d) Traditional channels of communication are respected and not regarded as a barrier to development.

2.1.8. The state of agricultural information in Ethiopia

Rural development is an indispensable prerequisite not only for any improvement but also for the maintenance of a minimum basic living standard for a growing population.

The list of various rural development programs that have successfully replaced one another in Ethiopia is long. But none of them left any lasting mark on the rural scene. None of them even attempt to provide sound information about the areas they were supposed to develop (Samuel, 2001). This observation proves the difficulties the country's long-lived extension system faced in providing consistent, accurate and timely information in a systematic, coordinated and sustainable way to address the wide –ranging needs of the agricultural information users.

Even though vast amount of data are collected, virtually none of them are in a readily accessible form or in a suitable for dissemination (Samuel 2001). The situation to systematic agricultural data/information handling in country is not well-developed and could generally be concluded that there is no appropriate national system or entity that handles the gathering, processing and dissemination of agricultural information.

2.1.9. Generation and processing of agricultural information in Ethiopia

According to Samuel (2001), there are three major institutions which generate agricultural information in Ethiopia. These are government agricultural extension institution both at federal and regional levels, Central statistical Authority (CSA) and research institutions. The CSA is responsible mainly for macro-level data and statistics, whereas the Federal Ministry of Agriculture (MOA) and Regional Agricultural Bureaus are also mandated by law to collect process and disseminate data with respect to the performance of agricultural projects and programs. Agricultural research centers are also supposed to generate and disseminate technical data on new findings and other recommendations.

The regional agricultural development bureaus are the main source of agricultural data and information at regional level. Extension/Development agents collect data mainly for administrative purposes at the level of Development Centers.

Data generation and processing in agricultural bureaus have suffered from other weaknesses which include, among others, lack of general appreciation about the importance of agricultural data and information, attempts to collect more data than the existing data processing and management capacity, over-stretching the capacity of extension agents to collect data, lack of standardization of formats, inappropriate design of existing formats, lack of well documented instructions to accompany data collection formats, insufficient cooperation and support among data collectors and processors at various levels.

2.1.10. Common problems in information generation and use in extension institutions

According to Samuel (2001), Agricultural extension institutions of developing countries faced many constraints in their activities of information generation and use. Most of the problems caused due to the poor socio-economic conditions of their clients, farmers, and weak infrastructural and institutional development of the area where they have been working. For example, the following factors make their effort to generate and use information difficult:

- Extension institutions in developing countries and particularly those in Africa deal with many small and mostly subsistence farmers who are geographically dispersed in areas characterized by poor infrastructural development which makes communication difficult,
- Farmers are in most cases illiterate,
- Farmers in most cases do not maintain farm records,
- Farmers' problems and demands may change through time that may need new set of information,
- Weak and inadequate infrastructure and institutional development in rural areas.

2.2. Agricultural Extension and Women farmers

2.2.1. Women's Role in Agricultural development

Every country's development is focused mainly on the uplifting of the rural small-holder farming sector. Most people in this group are women who labour day and night to sustain the family's food supply and provide extra income to the households. The majority of women in developing countries falls within the small scale subsistence sector farming and produce more than 80% of the food for the Sub-Saharan Africa (Irvine, 1996). Women are the busiest people in the world. In addition, they find time to grow half of the world's food requirements (FAO, 1993). Women are the invisible agricultural producers in peasant society (Ellis, 1993). Nearly 85% of women's labor is spent in farming, which includes crop production and animal husbandry (Yeshi, 1997).

Women in Ethiopia play multiple and overlapping roles, which have increasingly put pressure on their health, food security, productivity and potential contribution to improved human welfare and economic development (Senait, 2000).

Generally, women are considered as sources of food and heads of household, while all the important activities of women are hidden behind the men. But, the fact is that women play a significant role in food production and in farm family as a whole.

2.2.2. Extension services towards women farmers

Almaz (2000), states that, gender studies on division of labor in agricultural sector in Ethiopia revealed that up to 40% of farming activities are done by women, especially in food production and processing. Despite the significance of women's role in agricultural development, evidence through developing countries show that women's farming productivity and efficiency levels often remain very low. Among the key reasons for this is lack of

technical advice on production and marketing, cultural practices, skills and technology. Extension services frequently fail to provide adequate information to women farmers due to failure to recognize their specific needs. In addition to their productive tasks they are frequently over burdened with household responsibilities which they cannot delegate, they are often less educated than men and have a more limited access to resources such as credit. If an extension program deals effectively with those constraints, it will be easier for women farmers to get involved in activities (FAO, 1996).

Men and women perform different tasks they can substitute for one another only to a limited extent and this limitation creates different demands for extension information also, as men leave farms in search of paid employment in urban areas. Women are increasingly managing and operating farms on a regular and full-time basis (Edlu, 2006).

Evidence suggests that women have not benefited as much as men have from publicly provided extension services. Most local government staff, researchers and other rural visitors are men. In most societies, women have inferior status and are subordinate to men. There are variations and expectations, but quite often women are the poor and deprived class within a community. They often work very long hours, and they are usually paid less than men. Rural single women, female heads of household, and widows include many of the most wretched and unseen people in the world (Chambers, 1983).

Agricultural information is not effectively reaching and benefiting these key persons in the food security chain (FAO, 1996). According to Saito and Weidemann (1990), a survey of women farmers in Burkina Faso found that 40% had some awareness about the existence of modern crop and livestock production technologies

For most of the women, relatives and friends were the source of information; nearly one-third had acquired their knowledge from the extension service, and only 1% had heard of the technologies from their husbands (Saito and Weidemann, 1990). On the other hand, Dagnachew (2002), states that extension efforts and technological packages usually address men farmers. Extension agents are most likely to visit male farmers than female farmers. The

low level of women's education and cultural barriers prevent them from the exposure to extension channels by their initiative. The male-dominated extension system also often restrains from contacting and working with women due to the strong taboos and value systems in the rural areas.

2.2.3. Women's Access to Extension Services in Ethiopia

Women are typically, and wrongly, still characterized as "economically inactive". Agricultural Extension services still do not attach equal importance to reaching women farmers or women on farm. Survey results in the past study shows that only 37% of the women have participated in extension advice and training (Habtemariam, 1996). Policy makers and administrators typically still assume that men are the farmers and women play only "supportive role" as farmer's wives.

Due to this attitude, the agricultural extension services in Ethiopia are male dominated from the national to the local levels. Front-line male extension workers tend to work mainly with male farmers, they do so less often with female household heads. Farming wives rarely gain different advice from the government extension services. Yet women, whether heads of household, wives or daughters, are actively involved in farming throughout the country.

According to the study by Habtemariam (1996), women's participation in home economics is much greater (76.94%) than their participation in extension training (36.93%). The main emphasis of the training was on family planning (30.2%), child care (17.9%) and on sanitation (17.6%) by ignoring field crop production or livestock management in which women are also actively involved.

The proportion of women currently serving in the extension system is low. The survey result indicates that only 27.7 percent of the DAs are female (Habtemariam, 1996). Given the cultural constraints inhibiting the interaction of men and women, female farmers both in male and female-headed household are not benefiting as well from the extension system. As DA's are evaluated mainly based on the types and number of technology packages they were able to

disseminate and the number of farmers they could reach out, the DAs are more likely to focus their efforts to the relatively well to do farmers. This is because women are generally not perceived to be farmers or are poor and live in remote locations. This would further limit women's access to extension and other services including credit, fertilizer and improved seed. When inputs are limited in supply, again women would receive lower priority than their male counterparts. In addition to these factors, rural women's ability to improve production and productivity is also by gender determined responsibilities such as feeding and caring for the family.

2.2.4. Limitations of Ethiopia's agricultural extension services in relation to gender issues

Though women play a critical role in agriculture, it is recognized that the Ethiopian agricultural extension system suffers from a number of weaknesses in its services for rural women. According to Habtemariam (1996), the study shows that:

First, there are misperceptions and prejudices about women's actual and ideal roles with the result that they are often excluded from the target group of extension. In Ethiopia farming is traditionally considered as male activity. Women's work in agriculture sector was considered marginal.

Second, agricultural extension in Ethiopia focuses on efficiency objectives and on few "progressive" farmers to the relative neglect of resource-poor households, and female heads of rural households. The extension methodology uses the DAs as the main point of contact between the Bureau of Agricultural and farmers through the use of demonstration plots on the farms of better, more advanced farmers who are willing to serve as model for five to ten of their neighbors. Since some women, particularly those in female-headed households are generally among the poorest of farmers; their chance to be selected by DAs for extension services is very low. They are often too poor to afford the inputs necessary for optimum productivity even when inputs are available.

Third, there is a gender bias against women and among extension workers. Extension services in Ethiopia are male- dominated and work mainly with male farmers, partly for cultural reasons and partly because the extension system itself has traditionally relied on the use of contact farmers, whose criteria for selection tended to exclude female farmers. Assistance for women had usually been in the form of separate women's projects aimed at assisting women in their reproductive role, child care, sanitation, nutrition and home management or in traditionally accepted roles such as sewing, knitting, processing of crops and animal by-products, brewing beer, vegetable production and marketing. In the two case study *Woredas* (Habtemariam, 1996), 87% of women interviewed acknowledged the lessons they have drawn from home economists mainly on the use of improved stoves, nutrition and home management planning. But they complained that home economists are stationed in *Woreda* or zonal towns and come to their areas once or twice a year. Thus their impact on rural women's life is insignificant. Home economists were not in a position to advise women on aspects of field crop or livestock production.

Fourth, the extension services were managed in a top-down fashion, which was reflected in extension program planning. This gives a very little opportunity for grass root extension staff to take the initiative and respond to local demands in any significant way. Similarly, the management and organization of the extension service did not allow for great deal of teamwork and there was little emphasis on multidisciplinary approaches to problem solving.

Fifth, the different needs and constraints of different categories of people are not distinguished and treated accordingly. Extension needs of men and women are basically different. Women in male-headed households also have different needs from women who are household heads. It is difficult to reach women in the male-headed households. They generally do not attend meetings, as it is generally the husbands that attend. Women in these households need to negotiate with husbands to allow them to participate in development activities autonomously. Women headed households are among the poorest and more vulnerable groups. The prevailing social and cultural constraints on the interaction of men and women, the lack of a clear strategy by extension system for targeting female farmers in general, and female-headed households in particular, limits the extension system's ability to

reach female-headed households. Female-headed households also lack alternative productive resources that would enable them to improve their productivity and income, which in turn would contribute to ensuring household food security.

Habtemariam (1996), sum up that, agricultural extension as an educational and communication tool makes a vital contribution to agricultural production and rural development. It is thus important to provide women farmers both male and female-headed households with efficient, effective and appropriate technology, training and information. However, it is a mistake to view "rural women" as a homogeneous social classification or to drive policies and services for women in agriculture that are not based on empirical research which capture their diversity. The consequence is that extension service needs to be adapted to circumstances as there is no one one-package extension model, which can work for all women in all places.

2.3 Conceptual Framework of the study

Literature review on information flow in agricultural extension indicated that, information is vital for rural people, which they can use to improve their productivity, income and welfare and to manage the natural resources, on which they depend, in a sustainable way. Information and its dissemination is a subject of considerable importance to rural population, especially to rural women who commonly suffer from isolation and have difficulties in communicating their priorities to decision makers. Agricultural extension depends to large extent on information exchange between and among farmers on the one hand, and a broad range of other actors on the other hand. To plan effective extension activities, extension workers need to carry out some more investigations on women's channel of communications. Based on this and similar areas of conceptual constructs; analyzing agricultural information network output of farm women and identifying factors influencing women's information network output (knowledge of dairy farming practices) were considered under this investigation.

In this study efforts were made to reveal factors influencing agricultural information network output of farmwomen that varies according to personal, socio-economic, psychological characteristics of rural women and situational factors.

Based on the literature review that deal with personal characteristics of farmers which affect different farmers groups toward information exchange such as; age, marital status, level of education, communication skill, family size and sharing the information with others have been assumed important and are considered in this study.

According to previous studies, variables considered as socio-economic characteristics of women farmers were income of the household, size of land holding and radio ownership.

On the other hand, achievement motivation, level of aspiration, interpersonal trust, positiveness, empathy of women farmers and their attitude towards DAs were assumed as important psychological factors which affect farmers in the exchange of agricultural information.

Lastly, social participation, information seeking behaviour, cosmopolitness, access to credit and extension participation were conceptualized and identified by considering as they are important situational factors.

Therefore, in this study the researcher tries to analyze these relationships, identify the influence of independent variables on the dependent variable and also tries to identify the constraints and opportunities of agricultural extension in reaching out farm women. The conceptual framework diagram of this study is presented in figure-1.

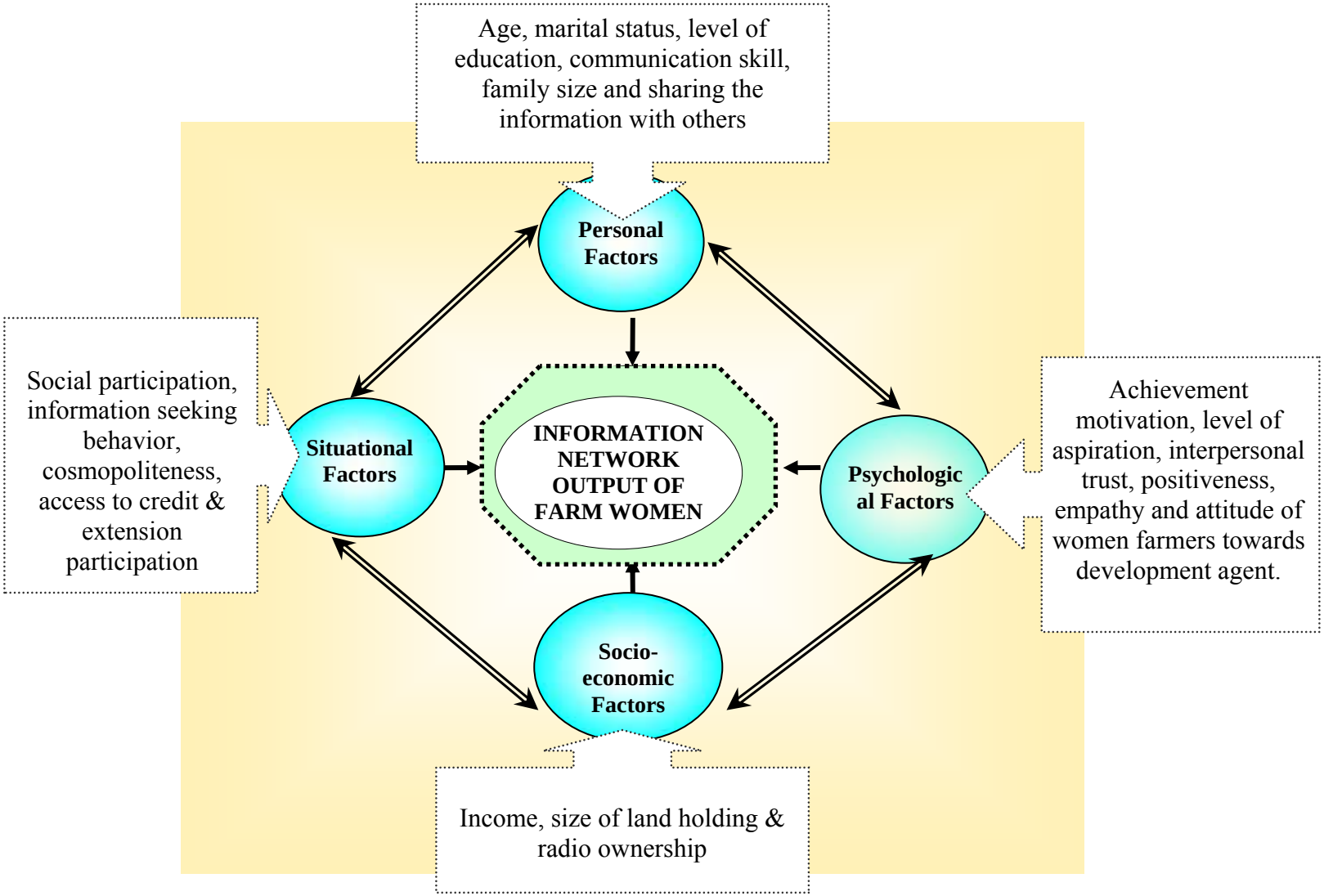

Figure 1Conceptual Framework diagram

3. METHODOLOGY

This chapter starts by presenting the different aspects of the study *Woreda*. It also provides details of the methodology followed to conduct the survey such as determination of sample size, sampling technique, data type and data source, method of data collection and methods of data analysis. It concludes by specifying the Multiple Linear Regression model used and the variables.

3.1. Description of the Study Area

Dale *Woreda* is one of 10 *Woredas* in Sidama Zone and covers a total area of 1,411 km^2, at about 320 km south of Addis Ababa. The *Woreda* is subdivided into 76 PAs. According to CSA (2003), the population of the *Woreda* is estimated as 369,548 of which women account for 57.6% of the population. The altitude of the *Woreda* ranges from 1170 masl around Lake Abaya to the west, reaching about 3200 masl in the eastern part of *Woreda*. The altitude at Yirgalem, which is the *Woreda* headquarter, is 1765 masl

The mean annual rainfall recorded at Awada Research sub-centre in Yirgalem is 1314 mm. Rainfall declines as one move from the highlands in the east to lowlands in the west.

There are two cropping seasons in the area, *Belg* (short rainy season) from March to April and *Meher* (main rainy season) from June to September. *Belg* rains are mainly used for land preparation and planting long cycle crops such as maize and seedbed preparation for *Meher* crops. The *Meher* rains are used for planting of cereal crops like barley, *teff*, wheat and vegetable crops. *Meher* rains are also responsible for the growth and development of perennial crops such as *enset*, coffee and chat. Livestock also play a major role in crop production in areas of the mid highlands and lowlands for cereal production (draught power) in addition to meat and milk; it also denotes prestige and asset to the households.

Farming systems

According to IPMS (2005), two main farming systems can be found in Dale *Woreda*. The garden coffee, *enset*, and livestock (hereafter referred to as coffee/livestock system) system is found east of the main road transecting Dale from north to south. The terrain is hilly and soils are red (Nitosols).

Rainfall is higher and more reliable than in the dry midlands haricot bean/livestock system. The farming system is composed of garden coffee, *enset*, and cattle, which are tethered and kept for manure and production of dairy products. Other crops in the system are haricot beans (as an intercrop), yam, cereals, fruits, mainly avocado and bananas. Because of the perennial nature of the crop and the small holding size (between 0.25-0.5 ha per family), hand hoeing is the predominant method of cultivation.

The Cereals, *enset*, haricot beans, garden coffee, and livestock (hereafter referred to as haricot bean/livestock system) system is the other main farming system in Dale *Woreda*.

This system is found west of the road transecting Dale from North to South. The terrain varies from relatively flat to hilly. Black soils (Pellic Vertisols) are commonly found on the flat areas and red soils on the slopes. Rainfall is lower and more erratic than in the coffee system. This system is dominated by cereals (maize, *teff*) rotated with haricot beans. *Enset* is cultivated near the homesteads. Garden coffee is grown in small patches, on the red soils.

Extensive grazing areas are found, which are used for herding the oxen, cattle and goats. Average farm size is estimated at 1.5 ha. The farmers use oxen for their cultivation.

Besides these two major systems, two smaller systems can be found, one in the extreme east at the high altitude where farmers grow horticultural crops (shallots) and the other one in the extreme west, near Lake Abaya where a pastoralist system is found (IPMS, 2005).

Crop Production

The government is clear in its strategy for a market led development in that it has chosen two crops for this *Woreda*. i.e.

• Coffee

• Haricot beans (white variety-Awash 1)

According to the available statistics, the area under coffee is 15,375 ha and a total of 9.3 million kg of red cherry was sold in 2002/03 and 5.7 million in 2003/04. Garden coffee improvement is being promoted predominantly in the coffee/livestock system. A total of 42 PAs have been targeted for this specialization, While, there are 59 PAs where coffee is grown. The commercialization of the haricot beans is targeted for the haricot bean/livestock farming system. The area under beans at the moment is still small i.e, 2,300 ha and the estimated production is 670 tons. A total of 22 PAs are targeted for specialization. The government intends to commercialize the haricot bean for export purposes, using the Awash 1 variety (small white seeds). This is a new introduction to the area which can either be added to and/or replace the area already sown with the local red Wollayta variety (IPMS, 2005).

Livestock

The main livestock species in the *Woreda* are cattle, goats and sheep. The livestock resources are cattle 225,698 (82,666 local cows and 1584 crossbred dairy animals, 80% are in urban and peri-urban areas); sheep 30,152; Goats 31,443; Poultry 218,923; Horses 2,498; Mules 431; Donkeys 16,321; and Beehives 10,949. Production systems range from extensive system in the lowlands (haricot bean/livestock system) to intensive tethered system in the major coffee/livestock system. Sheep production is important in the *Dega* (highlands) areas. Cattle, sheep and goat production is major in the mid-altitudes and goat, cattle, and sheep production are important in the lowland or *Kolla* areas. Land preparation is mainly done by oxen power in the coffee/livestock system or human power using hoe in the coffee/livestock, depending on land size and availability of oxen. Oxen ownership is very low and farmers share their oxen for ploughing. In the *Woreda*, only 16% of the farmers have a pair of oxen, 26% have

one ox and 58% have no oxen. There is a large resource of production of skins and hides in the *Woreda*. However, only 37% of the marketable skins and hides were officially marketed in 2004. There is a plan to increase the proportion of marketable skins and hides to 70% in three years. Production of fattened cattle, goat and sheep has great potential and there is a plan to enhance meat production in the *Woreda*. The poultry production system is traditional using local birds. The market-led priority livestock commodities incorporated in the *Woreda* development plan are: 1. Dairy Production 2. Meat production from fattened ruminants (mainly cattle and goats). 3. Skins and Hides 4. Poultry production. Apiculture is identified as a potential commodity for development (IPMS, 2005).

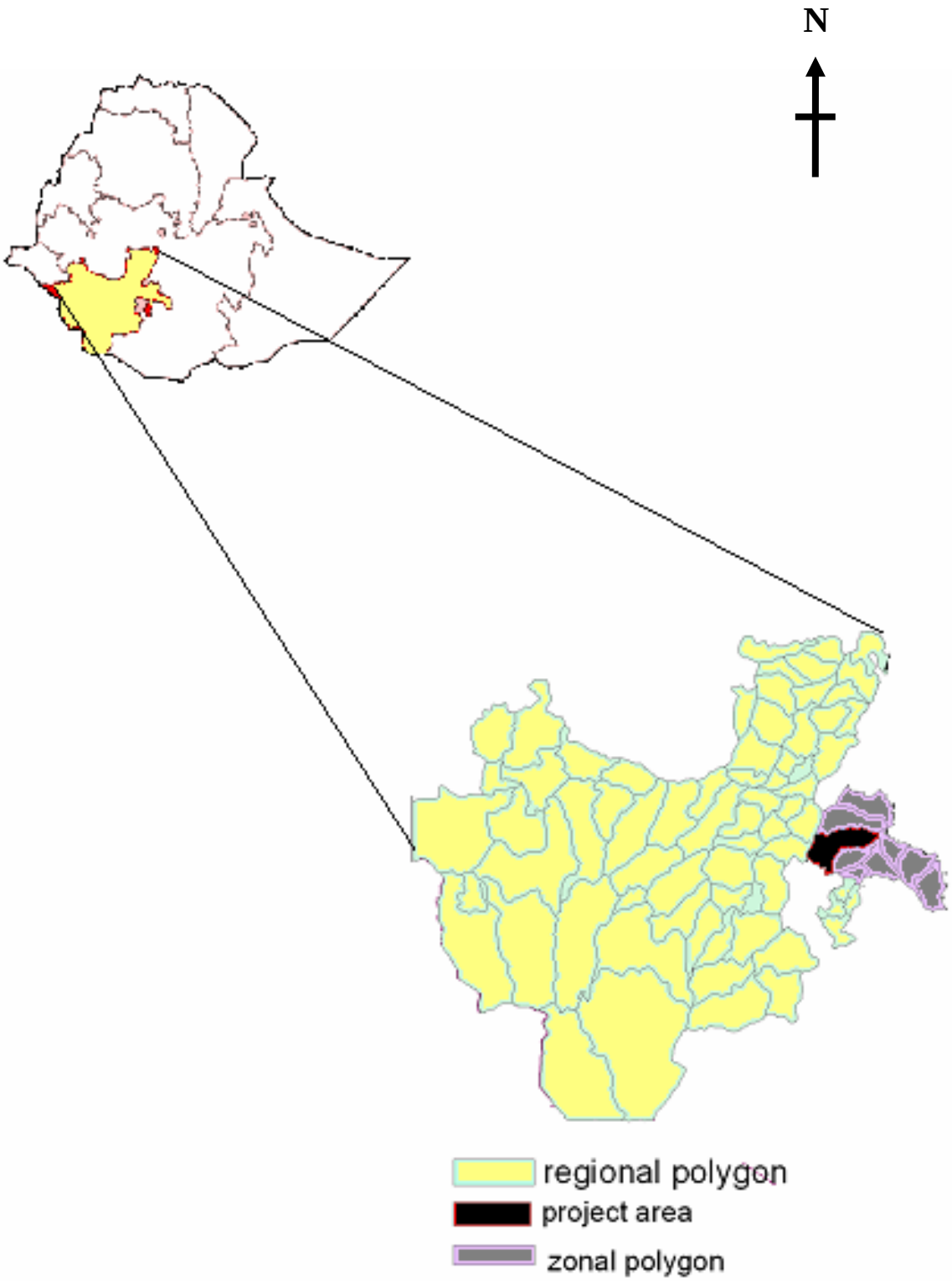

Figure 2 Location of the study area

3.2. Sampling Technique

Precision of facts is greater from a census. Nevertheless, due to financial and time constraints, absolute coverage of the entire community is not practical for a student research. Sampling allows the researcher to study a relatively small number of units representing the whole population (Sarantakos, 1998). This study used both probability and non-probability sampling techniques.

Sampling design

Dale *Woreda* was purposively selected for the study since it has significantly highest share of women's population (CSA, 2003); promotion of dairy cattle management is one of the thrust areas in the *Woreda* development plan, in which the active role of women is significant and it is one of the Pilot Learning *Woredas* (PLW) of IPMS, where dairy has been identified as a priority area for market-oriented development.

At the time of planning this study, Sidama Zone had 10 *Woredas,* later; it was subdivided into 19 *Woredas*. As a result of this, the then Dale *Woreda* was divided into three new *Woredas*, namely Loca Abaya, Wonsho and Dale. Since the research proposal was prepared and defended before the separation of the previous district, the study has been continued without any change, based on the defended proposal.

This study used a three stage sampling procedure, in which both purposive (non-probability sampling) and simple random sampling techniques (probability sampling) were used to select the Peasant Associations and sample respondents. In the first stage, all 76 PAs of the Woreda were put in order of their crossbred cattle population, and out of them four PAs were purposively selected based on larger number of crossbred dairy cattle population and distance to town (two are close to town PAs, and the other two are far away from town PAs). These were Masincho, Awada, Wicho, and Hida Kaliti.

Sampling frame

To identify the sampling frame of the study, in the second stage using list of household heads that was taken from Dale *Woreda* IPMS office, list of households having dairy cattle (local or crossbred) were identified from selected 4 PAs by enumerators with the help of village leaders, from which the sample respondents were to be drawn.

Sample size

An important decision that has to be taken while adopting a sampling technique is about the size of the sample. Appropriate sample size depends on various factors relating to the subject under investigation like the time aspect, the cost aspect, the degree of accuracy desired, etc (Rangaswamy, 1995; Gupta and Gupta, 2002).

In this study, to determine sample size, different factors were taken into consideration including research cost, time, human resource, accessibility, and availability of transport facilities. In the third stage, from lists of farmers having dairy cattle (cows), 160 respondents were sampled randomly with purposive inclusion of 10% of FHHs from the respective list of farmers having dairy cattle in the selected four PAs using simple random sampling techniques (Table 1).

Table 1. Distribution of sampled respondents by PAs in the study area, Dale *Woreda*, 2007

Peasant Association	Total number of households *			Number of HH owning dairy cattle**			Number of respondents in the sample		
	MHH	FHH	Total	MHH	FHH	Total	Women in MHH (90%)	FHH (10%)	Total
Masincho	791	69	860	655	51	706	35	3	38
Awada	794	147	941	693	103	796	37	7	44
Wicho	1004	74	1078	699	37	736	37	3	40
Hida Kaliti	742	689	1431	667	43	710	35	3	38
Total	3331	979	4310	2714	234	2948	144	16	160

Source: * Dale *Woreda* IPMS **Own survey results 2007

3.3. Data Type and Data Source

Data collected for this research were both quantitative and qualitative in nature. For this, both primary and secondary data sources were used. The primary data sources were FHH and women in MHHs. Primary and secondary data had been collected to answer the objectives of the study. It includes, personal characteristics, socio-economic factors, situational factors, psychological factors and constraints and opportunities of agricultural extension services in reaching women farmers.

Data had been gathered through interview, discussions and observations. Secondary data sources were reports, records of DAs and, published and unpublished documents of *Woreda* Office of Agricultural and Rural Development (WOoARD).

The sources of qualitative data were key informants, DAs, SMSs, extension officials, village leaders, NGO workers and, groups of women and men farmers.

3.4. Methods of data collection

3.4.1. Quantitative data collection methods

For the purpose of data collection, female enumerators, who have acquaintance with socio economic concepts and knowledge of the culture of the society as well as local language proficiency were selected, trained and employed.

Quantitative data were collected through personal interviews. The respondents were interviewed using a pre-tested, structured interview schedule (See Appendix Table 1). To collect data on information network between women farmers and actors, among Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) tools info-source-use exercise (Tool B3/a) and communication network sheet (Tool B3/b) were used with suitable modification.

These tools help to identify the relevant information sources and users of these knowledge and information, the importance, closeness and value of the information sources existing in the study area (Salomon and Engel, 1997). Restructuring has been done using sufficient number of non-sample respondents through a pilot study. Based on the nature and extent of responses obtained, necessary modifications and further editing were done in the interview schedule to ensure its clarity and completeness for generating the needed information from the respondents.

3.4.2. Qualitative data collection methods

Qualitative data were used to supplement and to fill gaps during the quantitative data collection process. Qualitative data were collected through field visits; observations; informal interview with key informants, Village leaders, DAs, SMSs, NGO workers and extension officials; discussion with separate focus groups of women and men farmers.

Focus group discussion was held on specific topics with small groups of people (that consists 7 to 8 members) who have intimate knowledge about the topic under consideration. Often, researcher has chosen to ensure that the discussion does not diverge too far from the original topic and that no participant dominates the discussion.

3.5. Methods of Data Analysis

The role of statistics in research is to function as a tool in analyzing its data and drawing conclusions there from. Only after this, we can adopt the process of generalization from small groups (i.e., sample) to population. Depending on the objectives of a given study and nature of the data available, analysis to be made require different approaches. In fact, there are two major areas of statistics viz., descriptive statistics and inferential statistics.

In this study, data were analyzed using different quantitative and qualitative statistical procedures and methods. Descriptive statistical tools were used to analyze the quantitative

data. The important statistical measures that were used to summarize and categorize the research data were means, percentages, frequencies, and standard deviations. The qualitative data were partly analyzed on spot during data collection to avoid forgetting and to be able to fill the gaps in the quantitative data.

Among the measures of correlation, Karl Pearson's Coefficient of Correlation(r) was applied to analyze the data. The degree of association or correlation between two variables X and Y is answered by the use of correlation analysis (Gomez and Gomez, 1984; Kothari, 2003).

Karl Pearson's coefficient of correlation(r) is also known as the Product Moment Correlation Coefficient. The value of 'r' lies between. +1 and -1 Positive values of 'r' indicate positive correlation between the two variables (*i.e*., changes in both variables take place in the same direction), whereas negative values of 'r' indicate negative correlation *i.e.*, changes in the two variables taking place in the opposite directions. A zero value of 'r' indicates that there is no association between the two variables. When r = (+) 1, it indicates perfect positive correlation and when it is (-) 1, it indicates perfect negative correlation. The value of 'r' nearer to +1 or -1 indicates high degree of correlation between the two variables (Kothari, 2003).

The existence of a significantly high correlation between two variables tells us nothing about why the correlation exists. In particular, the correlation does not tell us that one variable is the cause and the other is the effect (Browen and Starr, 1983).

Multiple Linear Regression (MLR) analysis was another statistical technique used to analyze the influence among variables (*i.e.* single dependent variable and several independent variables) with the object of using the independent variables whose values are known to predict the single dependent value (Hair *et al*, 1998).

According to Browen and Starr (1983), the regression equation takes the form:

$$y=a+b_1x_1+b_2x_2+b_3x_3+...+b_px_p$$

Where:

y = Dependent variable

x = Independent variable (of there are p)

a = y intercept

b = the slope of the line

Estimation procedure

Following the completion of the data collection, the responses were coded and entered into SPSS version 13.0 for analysis.

Before estimating the models, it was necessary to check if multicollinearity exists among the explanatory variables. If multicollinearity turns out to be significant, the simultaneous presence of the two variables will reinforce the individual effects of these variables.

According to Gujarati (1995) there are various indicators of multicollinearity and no single diagnostic will give us a complete handle over the collinearity problem. For this particular study, Variance Inflation Factor (VIF) and condition index (CI) were used for continues variables.

The larger the value of VIF, the more it is troublesome. As a rule of thumb, if the VIF of a variable exceeds 10 (this will happen if R_i^2 exceeds 0.95), that variable is said to be highly collinear (Gujarati, 1995). Following Gujarati (1995), the VIF is given as:

$$\text{VIF } (X_j) = \frac{1}{1-R_j^{\,2}}$$

where, R_j^2 is the coefficient of determination when the variable X_j is regressed on the other explanatory variables.

A condition index greater than 15 indicates a possible problem and an index greater than 30 suggests a serious problem with multicollinearity.

Similarly, there may be also interaction between qualitative variables, which can lead to the problem of multicollinearity. To detect this problem, coefficients of contingency were compounded. The contingency coefficient was compounded as follows:

$$C = \sqrt{\frac{\chi^2}{n+\chi^2}}$$

Where, C is coefficient of contingency, $\chi 2$ is chi-square test and n = total sample size.

3.6. Variables and their definitions

3.6.1. Dependent variable

The dependant variable of the study is the Agricultural information Network output in terms of knowledge. The variable is operationalized as knowledge of farm women on dairy farming practices. In order to measure the farmers' level of knowledge about dairy farming practices 'teacher- made type' test was developed. Salient features of this technology were selected in consultation with the concerned SMS of regional and WOoARD. Then suitable questions were framed to invoke responses from the farmers about the selected salient features. The various items were selected for the knowledge test in respect of dairy farming practices was given weights as per their importance.

3.6.2. Independent variables

For this study, twenty independent variables were hypothesized to influence the dependent variable. Out of these variables fifteen were continuous and five were discrete. Independent variables include the personal characteristics, socio-economic factors, situational factors and psychological factors of rural women that may influence the dependant variables. The selection of independent variables is based on the past research and published literature related to the study.

Age: is measured in terms of number of years of age of the respondents. Since age is a factor that normally makes the rural women confined more to household chores, it was assumed that age would have a negative relationship with agricultural information network output.

Marital status: indicates whether respondents are married, unmarried, single, or widowed. Since married women will have more roles to be performed, a positive relationship was anticipated between marital status and agricultural information networks of farmwomen.

Education level: Education refers to the level of formal and non-formal education and will be measured in terms of ability to read and write and enrolment in primary, secondary schools or above. Educational level as a variable helping exposure to information, but also positively affects use of information.

Communication skills: In this study communication skill is referred to as the ability to express ideas effectively in written or spoken form, and the ability to listen attentively. This variable would be measured using list of items selected through systematic procedure. Communication skill is anticipated to have positive relationship with information network output.

Positiveness: defined as a person's quality that is characterized by displaying certainty, acceptance, or affirmation. It will be measured by respondents' willingness to discuss

agricultural matters with other farmers. The variable is assumed to have positive relationship with the dependent variable.

Empathy: is defined as the ability to imagine oneself in another's place and understand the other's feelings, desires, ideas, and actions. This variable would be measured using list of items selected through systematic procedure. The variable is assumed to have positive relationship with dependent variable.

Interpersonal trust: Expectancy held by an individual or a group that the word, promise verbal or written statement of another individual or group can be relied upon (Rotter, 1967). Trusting individuals will be more likely than less trusting individuals to share information each other. Therefore, the variable is assumed to have positive relationship with the dependent variable.

Income: income is operationally defined as the value of the products of the household after home consumption and income obtained from off-farm and non-farm activities that is expressed in birr per year. The income level is anticipated to have a positive relationship with the dependant variable since normally it becomes a facilitating factor.

Size of land holding: This refers to the area (local unit 'Timad') of cultivated land possessed by the respondents or their families. It was assumed that larger the farm size, the farmer has, better access to use combination of technological packages. Therefore, it was hypothesized that land size has a positive relationship with the dependant variable.

Family size: is the size of the family of the respondent measured in terms of total number of members in the family including aged persons and children. Higher number of family members leads to decision to take risk for participation in technology packages. This also leads to exposure to get information. Therefore, family size contributes to the variation in getting access to agricultural information. In this study, family size was assumed to have positive relation to agricultural information network output.

Radio ownership: The farmers who own radio have the opportunity of getting more agricultural information. It is, therefore, assumed that it affects the agricultural information network positively.

Social participation: Social participation in this study refers to the involvement in social activities and membership of respondent in various formal and informal organizations, either as member or as an office bearer. It was measured in terms of membership or official status in any formal or informal organizations, along with the frequency of participation and type of organization in which she is a member using the scale developed by Trivedi (1963) with slight modifications. Social participation was expected to have positive relationship with the dependant variable

Achievement motivation: This was defined as the need in an individual to perform different roles with some degree of excellence. This variable was measured using the scale suggested by Pareek and Rao (1992), with slight modifications. Achievement motivation was expected to have positive relationship with the dependant variable.

Information seeking behavior: This was defined as the degree to which the respondent was eager to get information from various sources on different roles she performs. This was measured in terms of how much information was sought, how frequently and from where the information was sought. Information seeking behavior was assumed to have positive relationship with the dependent variable.

Cosmopoliteness: This is the degree of orientation of the respondents towards outside the social system to which she belongs. It is measured in terms of frequency of visits to outside her village and the purpose of such visits. Cosmopoliteness was expected to have positive relationship with the dependant variable since it provides more chance of exposure to external information.

Level of aspiration: This is a strong desire or an ambition to achieve something better in the life. This variable was measured using the scale suggested by Pareek and Rao (1992) with

slight modifications. Level of aspiration was expected to have positive relationship with the information network output.

Attitude towards Development Agent: The researcher operationally defined attitude in this study as the degree of positive or negative attitude of women farmers towards Development Agent. This variable was measured using a Likert type scale (Thurstone, 1976).

Sharing of available information: is defined as the extent to which respondent shared the information with others including family members, friends or neighbors, extension agent, etc. This was also anticipated to have a positive relationship with information network output.

Access to credit: Access to credit can relax the financial constraints of women farmers. It indicates whether respondents have access to credit or not. It was expected, in this study, that male farmers have better access to credit than women. Therefore, access to credit has impact on level of utilization of recommended technological packages and this in turn will expose them to different information. Therefore, the variable was assumed to have a positive relationship with the dependant variable.

Extension participation: This represents women farmers' frequency of contact with development agents and frequency of participation in extension planning, training, farmers' field day, on-farm trial and demonstration regarding to livestock production in general and dairy farming practices in particular. It was measured using a weighted index. It was assumed that this variable will have a positive relationship with the information network output.

4. RESULTS AND DISCUSSION

In this chapter, the results of the study are presented and discussed in detail to address the three objectives of the research. The chapter is divided into five sections. These sections are agricultural information network of farm women; descriptions of personal, socio-economic, situational and psychological characteristics of sample respondents; relationship between dependent and independent variables; influence of independent variables on agricultural information network output of farm women which is measured in terms of knowledge of dairy farming practices; and the constraints and opportunities of extension services in reaching out to rural women.

The result is presented using descriptive statistical tools such as mean, percentage, standard deviation; Pearson's Product-Moment Correlation Coefficient employed to measure the relationships between dependent and independent variables; Chi-square test used to evaluate the significance of the association between variables and thereby to test the hypotheses; and Cramer's V statistics used to specify the strength and direction of association between variables of categorical. MLR was also used to see the level of influence each independent variable exerts in unit change of the dependent variable.

4.1. Agricultural Information Networks of Farm Women

This section covers information exchange between women farmers and actors, in respect of information source and its use pattern, importance of the information sources, proximity of information sources and value of information from sources on dairy farming. In order to measure information exchange and actors, different scales were used.

4.1.1. Information Exchange and Actors

4.1.1.1. Information source and its use pattern

Information source and its use pattern was analyzed to assess the actors strengths and weaknesses with respect to information exchange in a particular direction. Actors who are networking for information exchange can be looked at and compared on the basis of many different characteristics, but in this subsection they are seen only as agricultural information source particularly on dairy farming. Distribution of frequency of use of actors as information source on dairy farming to the respondents in terms of their use is presented in Table 2.

Table 2. Distribution of actors as information source to the respondents in terms of their frequency of use (N = 160)

No.	Actors	Frequency of use						Score	Rank
		Never (0)		Sometimes (1)		Always (2)			
		N	%	N	%	N	%		
1	Neighbors or friends	21	13.1	89	55.6	50	31.3	189	1st
2	Other farmers	20	12.5	103	64.4	37	23.1	177	2nd
3	Development Agents	59	36.9	73	45.6	28	17.5	129	3rd
4	Rural radio programs	81	50.6	46	28.8	33	20.6	112	4th
5	Religious organizations	95	59.4	26	16.3	39	24.4	104	5th
6	WOoARD	77	48.1	67	41.9	16	10	99	6th
7	Peasant association	73	45.6	76	47.5	11	6.9	87	7th
8	Farmers' cooperatives	107	66.9	42	26.3	11	6.9	64	8th
9	Input supplier organizations	118	73.8	35	21.9	7	4.4	49	9th
10	Training, demonstration & field days	126	78.8	27	16.9	7	4.4	41	10th
11	Leaflets & folders	134	83.8	23	14.4	3	1.9	29	11th
12	NGOs	144	90	13	8.1	3	1.9	19	12th

The number of actors used to assess the information source and their use pattern, were twelve. It could be observed from Table 2 that, neighbors or friends are the major and the first important source of information for the farm women. This survey result is similar with the result of focused group discussion conducted in this study. According to this study, other farmers (other than neighbors or friends) serve as the second important information source. The survey result showed that the third and fourth major sources of information are Development Agents and rural radio programmes respectively. As showed in the Table 2, religious organizations, WOoARD (*Woreda* Office of Agriculture and Rural Development) and PA serve as fifth, sixth and seventh source of information respectively. Farmers' cooperatives; input supplier organizations; training, demonstration & field days serve as eighth, ninth and tenth information sources respectively. Leaflets & folders and NGOs serve as the least important sources of information respectively. This is probably because they never had access to them.

This study, also tried to summarize the agricultural information sources of the farmers in the study area through group discussion. During the time of group discussion the group members were familiarized with the discussion area and were expected to identify and prioritize the agricultural information sources of farmers in their area. The group members took care in listing all alternative sources of information available in their area using brain storming method and tried to refine, summarize and prioritize the listed alternative information sources again through brain storming method.

Table 3. Result of group discussion ranking information sources in terms of their importance

No.	Information sources	Women's group rank	Men's group rank
1	Neighbors or friends	1st	1st
2	Other farmers (relatives or colleagues)	2nd	2nd
3	Religious organizations	3rd	8th
4	Development Agents	4th	3rd
5	WOoARD	5th	5th
6	Peasant Association	6th	4th
7	Rural radio programs	7th	6th
8	Farmers' cooperatives	8th	7th
9	Training, demonstration & field days	9th	9th
10	NGOs	10th	10th
11	Leaflet & folders	11th	11th

The result of the group discussion also showed that, neighbors or friends stand first and the most important and leaflets and folders stand the last and least important. The result of the group discussion findings showed that farmers got more information easily from their neighbors than other sources available in their area. The second and third most important information sources of farmers in the study area were other farmers (other colleague farmers or relatives) and religious organizations. Development Agents, WOoARD, Peasant Association, rural radio programs and Farmers' cooperatives were serving as fourth, fifth, sixth, seventh and eighth source of information respectively. This might be probably because women farmers do not have much access to institutional formal services, since they are confined to home and neighborhood. Training, demonstration & field days, NGOs and leaflet & folders serve as ninth, tenth and eleventh source of information respectively for women farmers in the study area.

Similar results were identified by Saito and Weidemann (1990) indicating that for most of the women, relatives and friends were the source of information. Another study conducted by Dereje (2005) indicated that neighbor and colleagues are the major and the most important farmers' source of information. For women, their major sources of knowledge and information are informal sources, indigenous knowledge and their husbands (Clare and Ranjitha, 2005).The case study 1 presented below confirms the findings of the study.

Photo: A woman farmer W/ro Bekelech Babiso, Dale Woreda, SNNPR

Case study 1

The information source and its use pattern was best illustrated by a woman rearing local breed cows without using any technological packages in Hida Kaliti Peasant Association, Dale Woreda, SNNPR who told her experience of information source during focus group discussion.

A woman named Bekelech Babiso, age 38 married and living with her husband told the following story.

She said, "Years back, two of my cows delivered at the same time, as a result I started getting a lot of milk. However, I didn't get any person who buys the produced milk in my area, so I utilized it all for my family consumption. One day, a brother of my husband who lives in the nearby town came to our residence and after that he observed what was happening in my home, he advised me to take to the market the surplus milk produced, to those persons in the nearby town, Aposto, (Aposto is six kilometers from the Peasant Association), who took milk on contractual base and paid monthly. I have never heard such information before from anybody not even Development Agents. Then he connected me with those individuals in the town. Without delay, I started selling milk on contractual basis. I sold two liters of milk per day, and got 140 Birr monthly. Because of the information I got, my family life has changed noticeably.

To conclude, actors such as farmers or villagers, who are sometimes seen as 'beneficiaries' or 'target groups', may be essential sources of information in the information exchange for the extension system.

4.1.1.2. Importance of the information sources

This subsection indicates how respondents perceived the importance of the information sources to obtain information on dairy farming. Distribution of actors as information source on dairy farming to the respondents in terms their importance is presented in Table 4.

Table 4. Frequency distribution of information sources in terms of their importance (N=160)

No.	Actors	Relative importance of the source						Score	Rank
		Not important (0)		Somewhat important (1)		Very important (2)			
		N	%	N	%	N	%		
1	Neighbors or friends	12	7.5	88	55	60	37.5	208	1 st
2	Other farmers	14	8.8	101	63.1	45	28.1	191	2 nd
3	Development Agents	44	27.5	51	31.9	65	40.6	181	3 rd
4	WOoARD	64	40	46	28.8	50	31.3	146	4 th
5	Rural radio programs	70	43.8	47	29.4	43	26.9	133	5 th
6	Peasant association	69	43.1	52	32.5	39	24.4	130	6 th
7	Religious organizations	87	54.4	33	20.6	40	25	113	7 th
8	Farmers' cooperatives	90	56.3	44	27.5	26	16.3	96	8 th
9	Input supplier organizations	107	66.9	30	18.8	23	14.4	76	9 th
10	Training, demonstration & field days	104	65	42	26.3	14	8.8	70	10 th
11	Leaflets & folders	119	74.4	32	20	9	5.6	50	11 th
12	NGOs	126	78.8	20	12.5	14	8.8	48	12 th

The response analysis of Table 4 indicates that, neighbors or friends, other farmers (other than neighbors or friends), Development Agents, and WOoARD were 1st, 2nd, 3rd and the 4th most important sources of information for women farmers in the study area respectively. This might be probably because, the relationship is strongest between neighbors or friends who had similar background with others and could rely on each other. Respondents perceived that NGOs, leaflets & folders and training, demonstration & field days were the least most important source of information on dairy farming (Table 4). Therefore, low literacy level, lack of access to NGOs and moreover, the agricultural extension services considering women as housewives and mothers only, focusing mainly on male farmers might be reasons for least important sources.

4.1.1.3. Proximity of information sources

Proximity indicates how respondents were close to the information sources to get information on dairy farming. Frequency distribution of proximity of information sources on dairy farming is presented in Table 5.

Table 5. Frequency distribution of proximity of actors as information source (N = 160)

No	Actors	Proximity of the information sources						Score	Rank
		Not close (0)		Somewhat close (1)		Very close (2)			
		N	%	N	%	N	%		
1	Neighbors or friends	10	6.3	57	35.6	93	58.1	243	1st
2	Other farmers	12	7.5	77	48.1	71	44.4	219	2nd
3	Development Agents	49	30.6	69	43.1	42	26.3	153	3rd
4	Peasant Association	70	43.8	49	30.6	41	25.6	131	4th
5	Rural radio programs	83	51.9	48	30	29	18.1	106	5th
6	Religious organizations	88	55	32	20	40	25	112	6th
7	WOoARD	91	56.9	54	33.8	15	9.4	84	7th
8	Farmers' cooperatives	104	65	35	21.9	21	13.1	77	8th
9	Training, demonstration & field days	121	75.6	34	21.3	5	3.1	44	9th
10	Input supplier organizations	126	78.8	31	19.4	3	1.9	37	10th
11	Leaflets & folders	135	84.4	18	11.3	7	4.4	32	11th
12	NGOs	137	85.6	17	10.6	6	3.8	29	12th

According to the survey result, the most five close sources of information were neighbors or friends, other farmers (other than neighbors or friends), Development Agents, Peasant Association and rural radio programs. This might be due to the fact that women are more confined to home and neighborhood, so depend on sources in proximity.

4.1.1.4. Value of information from sources

This subsection indicates how valuable the information from the sources is. As Table 6 indicates, the information from Development Agents, farmers (other than neighbors or friends), WOoARD, and rural radio programs were the 1st to 4th most valuable respectively. This might be because; as it was discussed previously these information sources were the most frequently used, important and close sources of information to the respondents in the study area, which resulted in higher degree of perceived credibility.

Table 6. Frequency distribution of value of information from sources on dairy farming (N= 160)

No	Actors	Perceived value of information						Score	Rank
		Not valuable (0)		Somewhat valuable (1)		Very valuable (2)			
		N	%	N	%	N	%		
1	Development Agents	43	26.9	39	24.4	78	48.8	195	1st
2	Other farmers	10	6.3	109	68.1	41	25.6	191	2nd
3	WOoARD	63	39.4	35	21.9	62	38.8	159	3rd
4	Rural radio programs	64	40	47	29.4	49	30.6	145	4th
5	Peasant association	64	40	61	38.1	35	21.9	131	5th
6	Neighbors or friends	14	8.8	91	56.9	55	34.4	121	6th
7	Religious organizations	84	52.5	40	25	36	22.5	112	7th
8	Farmers' cooperatives	88	55	52	32.5	20	12.5	92	8th
9	Input supplier organizations	100	62.5	41	25.6	19	11.9	79	9th
10	Training, demonstration & field days	101	63.1	39	24.4	20	12.5	79	9th
11	NGO	122	76.3	26	16.3	12	7.5	50	10th
12	Leaflets & folders	125	78.1	25	15.6	10	6.3	45	11th

Interestingly, though other farmers (other than neighbors or friends) only rank 2nd in terms of importance as source, proximity and valuable, they have the highest credibility, followed by DAs.

People need both technical knowledge and awareness-raising information. These types of information/knowledge are not separate from other areas of life. They are part of the development process. In the process, information and knowledge become a development resource. This information resource gives the community power over their environment and life in general (Mchombu 2004).

In order to know, what the specific kinds of information are women wanted in relation to dairy production; information was gathered through focus group discussion among the respondents. During the focus group discussion with women groups, majority of the group members indicated health care, balanced feeding, hygiene and management as major kinds of information they seek.

4.2. Descriptions of personal, socio-economic, situational and psychological characteristics of sample respondents

In this section, descriptions of personal, socio-economic, situational and psychological characteristics is presented and discussed in detail. These are the hypothesized variables that might influence the dependent variable, knowledge of dairy farming practices.

4.2.1. Descriptions of personal characteristics of the sample respondents

Personal Characteristics include the variables related to personal characteristics such as age, marital status, level of education, communication skill, family size and sharing the information with others. The distribution of sample respondents based on their personal characteristics is presented in Table 6.

Table 7. Distribution of sample respondents based on their personal characteristics (N = 160)

Attributes		Frequency	Per cent
Age of respondent	15-29 (Younger)	41	25.6
	30-49 (Middle)	98	61.3
	50-65 (Older)	21	13.1
	Total	160	100.0
Marital status	Married	144	90.0
	Widowed	16	10.0
	Total	160	100.0
Level of education	Illiterate	79	49.4
	Can read & write	18	11.3
	Primary school	42	26.3
	Secondary school	21	13.1
	Total	160	100.0
Communication skills	Low	6	3.8
	Medium	33	20.6
	High	121	75.6
	Total	160	100.0
Family size	1-3	10	6.3
	4-6	83	51.9
	7-9	55	34.4
	>9	12	7.5
	Total	160	100.0
Sharing of available information with others	Share to a low extent	27	16.9
	Share to a medium extent	115	71.9
	Share to a high extent	18	11.3
	Total	160	100.0

Source: Computed from own survey data

4.2.1.1. Age of the respondents

Age of women farmers was one of the demographic characteristics hypothesized to influence agricultural information network output negatively; towards this end data on the age of women with respect to knowledge of dairy farming practices seems important.

The age of women who participated in the study ranged from 16 to 65. The mean age of the respondents was 35.81 years with the standard deviation of 10.488. The respondents were placed under three age categories. Women farmers aged 30-49 were the majority (61.3%) followed by age group 15-29(25.6%) and age group 50-65(13.1%).

4.2.1.2. Marital status

The respondents were categorized as single, married, divorced, and widowed. However, the result shows that the respondents fall under two categories only, married and widowed. Most of the respondents 144 (90%) are married and living with their husbands, while 16 (10%) were widowed. The proportion of married respondents was much larger than the widowed category.

4.2.1.3. Level of education

Education is one of the important variables, which increases farmer's ability to acquire, process and use agricultural related information. Low level of education and high illiteracy rate is typical in developing countries like Ethiopia. In fact, education level of farmers is assumed to increase the ability to use agriculture related information in a better way. Therefore, in this study, educational level is a variable helping exposure to information and its utilization.

As indicated in Table 7, 49.4% of the sample respondents were illiterates, 11.3% were able to read and write, 26.3% had elementary school education, and 13.1% had attended secondary

school education. There was a high illiteracy rate among women farmers. This is in agreement with most studies (Winrock, 2001).

4.2.1.4. Communication skill of the respondents

Communication skills in this study referred to as the ability to express ideas effectively in written or spoken form, and the ability to listen attentively. The respondents were categorized into three communication skills levels. The study revealed that there is significant difference between the three categories of respondents. As indicated in Table 7, 3.8%, 20.6%, and 75.6% of the sample respondents were categorized under low, medium and high level of communication skill respectively.

4.2.1.5. Family size

Higher number of family members leads to decisions to take risk for participation in technology packages. This also leads to exposure to get information. Therefore, family size contributes to the variation in getting access to agricultural information. In this study, family size was assumed to have positive relation to agricultural information network output.

Family size in the study area ranges from one person to twelve persons with an average of 6.39 persons per household. This was above the national average of five persons (CSA, 1994) which implies that the *Woreda* is relatively higher in family size. This is an indication for the importance of family planning, since it is higher than the average family size for the region to keep the balance between economy and the high population growth. The respondents were placed under four family size categories. Based on this, 6.3%, 51.9%, 34.4% and 7.5% had between 1 - 3, 4 - 6, 7 - 9 and greater than 9 family members respectively.

4.2.1.6. Sharing of available information

Sharing of available information is the extent to which respondents shared the information with others including family members, friends or neighbors, extension agent, etc. According

to the survey result, the extent to which respondents shared information with others was 16.9%, 71.9%, and 11.3% for low, medium and higher extent categories respectively. The majority of farm women were sharing information with others to a medium extent.

4.2.2. Descriptions of socio-economic characteristics of the sample respondents

Socio-economic factors relate to the position of the women farmers in society, which is determined by various social and economic variables such as radio ownership, size of land holding and income (Das, 1995). The findings are presented in Table 8.

Table 8. Distribution of sample respondents based on their socio-economic factors

Attributes		Frequency	Per cent
Radio ownership (N=160)	No	76	47.5
	Yes	84	52.5
	Total	160	100.0
Size of land holding in hectare (N= 160)	0-0.5	119	74.4
	0.51-1.0	39	24.4
	1.01-1.5	2	1.3
	Total	160	100.0
Mean = 0.41 Min = 0.04 Max = 1.33			
Total annual income (N =157)	<656.7 Birr	52	33.1
	656.71 - 1266.7 Birr	53	33.8
	>1266.71 Birr	52	33.1
	Total	157	100.0
Mean = 1421.04 SD = 1646.27 Min = 147.00 Max = 12000.00			

Source: Computed from own survey data

4.2.2.1. Radio ownership

The assumption was that respondents who own radio have a higher opportunity of getting agricultural information. The finding of the study indicates that, out of the total respondents 52.5 percent owned a radio while 47.5 percent were do not own radio. This shows that there was no significant variation between the number of farmers who own radio and who do not own one.

4.2.2.2. Size of land holding

Land is a primary source of livelihood for all rural households. It was assumed that larger the farm size, higher is the possibility to use a combination of technological packages. In the study area, the size of the land owned differed from household to household. Nevertheless, all households had access to land. This does not mean that women have access to land in their own right but rather own land jointly with their spouses.

It could be observed from Table 8 that the land holding is generally very small. Of the total 160 respondents, 119 (74.4%) own between 0-0.5 hectare, 39 (24.4%) own between 0.51-1 hectare, while only 2 (1.3%) own 1.01-1.5 hectares of land. Average land holding of total respondents was about 0.41 hectare with maximum and minimum of 1.33 and 0.04 hectares respectively. The findings are in line with national reports indicating the small land ownership in the rural areas. With the uncontrolled growth in population and the ensuing fragmentation of land, land holding size by farmers is very small.

4.2.2.3. Annual income of the respondents

Total annual cash income is an important variable explaining the characteristics of households, in that those who have earning relatively high income could probably participate in technology packages and this in turn will expose them to get new information.

As indicated in Table 8, the average annual income was Birr 1421.04 and the minimum and maximum annual income was Birr 147 and Birr 12000 respectively with standard deviation of Birr 1646.31. This shows a great variation among respondents.

4.2.3. Descriptions of situational characteristics of the sample respondents

Situational characteristics include the variables that might influence women's access to agricultural information, such as information seeking behavior, the extent of social participation, cosmopoliteness, access to credit and extension participation. The finding is presented in Table 9.

Table 9. Distribution of sample respondents based on their situational characteristics (N=160)

Attributes		Frequency	Per cent
Social participation	No	101	63.1
	Yes	59	36.9
	Total	160	100.0
Information seeking behavior	Low score	53	33.1
	Medium score	60	37.5
	High score	47	29.4
	Total	160	100.0
Frequency of visit to the nearby town or city (Comopoliteness)	Sometimes	70	43.8
	Once a week	56	35.0
	Most often	18	11.3
	Daily	16	10.0
	Total	160	100.0
Access to credit	No	142	88.8
	Yes	18	11.3
	Total	160	100.0
Extension participation	No	67	41.9
	Yes	93	58.1
	Total	160	100.0

Source: Computed from own survey data

4.2.3.1. Social participation

As presented in Table 9, among 160 interviewed women, more than half (63.1%) were having no involvement in any formal and informal institutions or organizations while 36.9% were involved in different types of formal and informal institutions or organizations. Regarding the type of institutions they were involved in, the majority of the respondents frequently involve in informal local institutions such as *ekub*, *edir* or *mahber* next to religious organizations and thirdly they frequently involve in women's associations (Table 10).

Table 10. Distribution of sample respondents based on the type of organizations participating in. (N= 133)

	Participation in type of institutions or organizations	Never (0)		Some times (1)		When ever conducted (2)		Total	
No		N	%	N	%	N	%	Score	Rank
1	Religious organizations	-	-	2	3.7	52	96.3	106	1 th
2	Informal associations	1	0.6	2	4.8	39	92.9	80	2nd
3	Women's associations	-	-	3	13	20	87	43	3rd
4	Farmers cooperatives	-	-	1	16.7	5	83.3	11	4th
5	Peasant Associations	2	33.3	4	66.7	-	-	4	5 th
6	HIV club	-	-	-	-	2	100	4	5 th

Source: Computed from own survey data

4.2.3.2. Information seeking behavior

Information seeking behavior is the degree to which the respondent is eager to get information from various sources on different roles she performs. According to the results of the study, from the total sample respondents, about 33.1%, 37.5% and 29.4% of them had low, medium and high score of information seeking behavior respectively (Table 9).

4.2.3.3. Cosmopoliteness

Cosmopoliteness is the degree of orientation of the respondent towards outside the social system to which she/he belongs. It provides more chance of exposure to external information. As indicated in Table 9, out of the total respondents 43.8%, 35.0%, 11.3% and 10.0% of the women visit the nearby town sometimes, once a week, most often and daily respectively. Every respondent in the study area for one or other reason visits the nearby town. More than 80% were visiting with the purpose of agricultural related issues and other reasons like shopping. Traditional rural markets are not only places to buy or sell, but also places to exchange information.

4.2.3.4. Access to credit

Access to credit can address the financial constraints of women farmers. The finding shows that, 88.8% of the respondents had no access to credit in 2005 production year, whereas, only 11.3% had access to credit (Table 9). Among those who have access to credit, only 5.6% of them have got credit in the same production year in the study area. The constraints for access to credit in the study area might be lack of collateral and unavailability of credit on time. Women were also asked to identify the source and purpose of getting credit, accordingly most of the respondents use both micro finance institute and local money lenders as sources of credit in the study area and major purposes of getting credit was, to meet family requirement, for growing crops, and for purchasing crossbred dairy cows.

4.2.3.5. Extension participation

In this study, extension participation represents women farmers' frequency of contact with DAs and frequency of participation in extension planning, training, farmers' field day, on-farm trial and demonstration regarding to livestock production in general and dairy farming practices in particular. Involving women farmers in various areas of extension program would be one of the main extension strategies to bring change in knowledge, skill and attitude.

Distribution of sample households based on their extension contact and frequency of contact with extension agent is presented in Table 9 and 11 respectively.

Table 11. Distribution of sample respondents based on their frequency of contact with DAs (N= 93)

Attributes	Responses	Frequency	Per cent
Frequency of contact with extension agent	Once in a week	36	38.7
	Once in two weeks	16	17.2
	Once in three weeks	14	15.1
	Once in four weeks	27	29.0
	Total	93	100.0

Source: Computed from own survey data

According to the survey result, 58.1% of the farm women have contact with development agents while 41.9% have no contact with development agents (Table 9). With regard to the frequency of contact with DA, 38.7%, 17.2%, 15.1%, 29% of respondents had been visited by DAs once in a week, once in two weeks, once in three weeks, and once in four weeks respectively (Table 11). Women were also interviewed to identify areas of extension activities they were participating in and the result is presented in Table 12.

Table 12. Distribution of sample respondents based on participation in extension programmes. (N = 160)

Response	Extension planning		Extension training		Farmers' field day		Demonstration & on-farm trial		Extension exhibition	
	N	%	N	%	N	%	N	%	N	%
No	147	91.9	148	92.5	150	93.8	149	93.1	158	98.8
Yes	13	8.1	12	7.5	10	6.3	11	6.9	2	1.3

Source: Computed from own survey data

Survey results shows that out of the total respondents only 8.1%, 7.5%, 6.3%, 6.9% and 1.3% of the women had participated in extension planning, training, farmers' field day, demonstration & on-farm trial and extension exhibition respectively. To conclude, agricultural extension services still do not actively involve women farmers or women on farm in their activities. Similar results were found by Habtemariam (1996) indicating that only 37% of the women have participated in extension advice and training.

Table 13. Distribution of respondents based on type of extension services obtained from DAs (N =160)

No.	Type of extension services	Frequency	Per cent	Rank
6	Technical support & input supply	17	18.3	1st
2	Theoretical information	15	16.1	2nd
1	Technical support	14	15.1	3rd
7	Technical support & experience sharing	11	11.8	4th
12	Technical, input supply & experience sharing	11	11.8	4th
4	Experience sharing	8	8.6	5th
8	Theoretical information & input supply	6	6.5	6th
3	Input supply	5	5.4	7th
5	Technical support & theoretical information	2	2.2	8th
10	Technical support, theoretical information & input supply	2	2.2	8th
9	Input supply & experience sharing	1	1.1	9th
11	Technical support, theoretical information & experience sharing	1	1.1	9th

Source: Computed from own survey data

As Table 13 indicates, technical support, input supply and theoretical information were type of extension services women farmers mostly getting from development agents in the study area. Similar explanations were given in the study conducted in Enemore and Ener *Woreda*, Gurage Zone by Edlu (2006), which showed that farmers got technical support, experience sharing, input and theoretical information from DAs. This same study generalized, major areas of service that the total HHs got from DAs was theoretical information (35.3%) and technical support (28.7%).

4.2.4. Description of psychological characteristics of sample respondents

Psychological characteristics include the variables of psychological dimension of individual respondent such as positiveness, empathy, interpersonal trust, achievement motivation, level of aspiration and attitude of women farmers towards development agent. The survey results are presented in Table 14.

Table 14. Distribution of sample respondents based on their psychological characteristics (N=160)

Attributes	Category	Frequency	Per cent
Interpersonal trust	Low	62	38.8
	Medium	54	33.8
	High	44	27.5
	Total	160	100.0
Positiveness	Low	58	36.3
	Medium	61	38.1
	High	41	25.6
	Total	160	100.0
Empathy	Low	105	65.6
	High	55	34.4
	Total	160	100.0
Level of aspiration	Low	115	71.9
	High	45	28.1
	Total		100.0
Achievement motivation	Low	102	63.8
	Medium	38	23.8
	High	20	12.5
	Total	160	100.0
Attitude towards DA	Low	55	34.4
	Medium		46.9
	High	30	18.8
	Total	160	100.0

Source: Computed from own survey data

4.2.4.1. Interpersonal trust

Interpersonal trust is the expectancy held by an individual or a group that the word, promise verbal or written statement of another individual or group can be relied upon. The respondents were put under three categories. Based on this, out of the total respondents, 38.8%, 33.8%, and 27.5% were in low, medium and high level of interpersonal trust respectively.

4.2.4.2. Positiveness of the respondents

Positiveness is a person's quality that is characterized by displaying certainty, acceptance, or affirmation. It was measured by respondents' willingness to discuss agricultural matters with other farmers. As indicated in Table 14, out of the total respondents, 36.3%, 38.1%, and 25.6% were in low, medium and high level of positiveness respectively.

4.2.4.3. Empathy of the respondents

Empathy is one of the important personal characteristics, which influences the ability of a farmer to understand the other's situation, feelings, desires, motive, ideas, and actions. The empathic farmer is one who genuinely feels the part he or she is performing. As presented in Table 14 the respondents were put under two categories of empathy. Based on this, 65.6% had low empathy and 34.4% were identified as having high empathy.

4.2.4.4. Level of aspiration

Level of aspiration is a strong desire or an ambition to achieve something. The respondents were put under two categories of level of aspiration. Based on this, 71.9% were with low level of aspiration and 28.1% were under high level of aspiration.

4.2.4.5. Achievement motivation

Achievement motivation was defined as the need in an individual to perform different roles with some degree of excellence. As presented in Table14, the respondents were put under three categories of achievement motivation. Based on this, 63.8% were under low achievement motivation, 23.8% under medium achievement motivation and 12.5% were identified as high achievement motivated categories.

4.2.4.6. Attitude towards Development Agent

Attitude towards DA operationally defined as the degree of positive or negative opinion of women farmers towards DA. According to the result of the study, respondents were categorized into low, medium and high score category and lower score shows negative attitude. The result shows that 34.4% were under low category and had negative attitude, 46.9% were medium and 18.8% of respondents had positive attitude towards DA. Therefore, the majority of interviewed women farmers in the study area show negative or moderate attitude towards DAs. This result was proved at the time of focus group discussion with the group of women. Case study 2 presented below confirms the findings.

Case study 2

In the study of women farmers' attitude towards Development Agent, generally negative attitude was observed. The case study done in Awada peasant association, Dale Woreda was confirming the result of the study.

At the time of focus group discussion with women farmers at Awada peasant association W/ro Meseret told the following tragedy of extension service she had experienced.

W/ro Meseret Koshe is 45 years old, married and, lives in Awada Peasant Association, Dale Woreda, SNNPR. W/ro Meseret was a well known model farmer in Awada PA as adopter of dairy package technology. She has more than eight crossbred dairy cows relatively with better management.

The horn of one of her dairy cows was growing toward the head and penetrating the head of the cow. Growth was increasing gradually and the cow suffered from the pain. She didn't know how to dehorn, so she informed the case to extension workers at woreda level and they promised to visit her, but one, two, three weeks passed still nobody provided solution to her problem. Finally, even if she didn't know what to do and what the consequence will be, she decided to cut the horn herself. One day she borrowed a saw from her neighbor which he uses for cutting metal and she cut the horn herself. As a matter of chance every thing went well without causing any danger. The cow that she loves got relief from the pain. "Oh God! Your name be blessed" this was her last word.

4.3. Relationship between dependent and independent variables

This section covers the findings on relationship between knowledge of dairy farming (dependent variable) and independent variables (personal factors, socio-economic factors, situational factors and psychological factors) through Pearson's Product-Moment Correlation analysis for continuous variables, χ^2-test and Cramer's V for discrete categorical variables. The relationships between knowledge of dairy farming and independent variables both discrete and continuous variables are presented in Table 15 & 16.

Table 15. Relationship between knowledge of dairy farming and discrete independent variables

Discrete Independent Variables		Chi-square test			
		χ^2	df	p	Cramer's V
Personal factors					
1	Marital status	0.416	2	0.812	0.051
2	Education level	5.692	6	0.459	0.133
Socio-economic factors					
3	Radio ownership	1.221	2	0.543	0.087
Situational factors					
4	Cosmopoliteness	5.454	6	0.487	0.131
5	Access to credit	14.622(**)	2	0.001	0.302

** Significant at the 0.05 level

The chi-square measures indicate whether there is a relationship between two variables; but they do not indicate the strength or direction of the relationship. A low significance value (typically below 0.05) indicates that there may be some relationship between the two variables. The nominal directional measures or Cramer's V indicate both the strength and significance of the relationship between the independent and dependent variables. But the low values for both test statistics indicate that the relationship between the two variables is a fairly weak one.

The output of chi-square test in Table 15 generally revealed that, among the five discrete independent variables, only access to credit shows positive and significant association with the dependent variable at 5% level of significance. The other four discrete variables such as marital status, level of education, radio ownership and cosmopoliteness were positively associated to the dependent variable, but all of them are statistically non significant.

The probable reason for the observed non significant association between knowledge of dairy farming practice and marital status might be due to the fact that the proportion of married respondents was much larger than that of widowed respondents. Whereas, the probable reason for weak and non significant relationship of the knowledge of dairy farming practice and radio ownership might be that those who own radio were almost equal with those who do not own.

There is positive (χ^2 = 5.692), fairly weak (Cramer's V = 0.133) and non significant relationship (p=0.459) between education level and knowledge of dairy farming. Therefore, findings in this study provide a supportive evidence for the presence of hypothesized relationship between two variables.

Table 16. Relationship between knowledge of dairy farming & continuous independent variables

Continuous Independent Variables		Pearson correlation analysis	
		r	p
Personal factors			
1	Age	-.042	.601
2	Family size	.002	.978
3	Communication skill	.687(***)	.000
4	Sharing available information with others	.578(***)	.000
Socio- economic factors			
5	Income	.167(**)	.036
6	Size of land holding	.217(***)	.006
Situational factors			
7	Social participation	.351(***)	.000
8	Information seeking behavior	.594(***)	.000
9	Extension participation	.419(***)	.000
Psychological factors			
10	Achievement motivation	.133	.094
11	Level of aspiration	.159(**)	.045
12	Positiveness	.564(***)	.000
13	Empathy	.557(***)	.000
14	Interpersonal trust	.641(***)	.000
15	Attitude towards DA	.101	.204

*** Significant at the 0.01 level (2-tailed).
** Significant at the 0.05 level (2-tailed).

The output of Pearson correlation analysis in Table 16 indicates that, out of fifteen continuous independent variables, eleven are positively and significantly associated with the dependent variable at different levels of significance. Except age which is negatively associated, others continuous variables such as family size, achievement motivation and attitude towards DA are positively correlated, but statistically they are non significant.

The negative association of age implies that, the two variables were not linearly related and when age of the respondents' increases, knowledge of dairy farming decreases. These prove the hypothesis that age has a negative influence on agricultural information network output of farm women. The findings of this study concur with the study done by Asres (2005).

The probable reason for non significant and quite weak relationship observed between age and knowledge of dairy farming might be that elder women do not seek many new ideas, since they try to conform to the practices they followed for a long time in their life.

4.3.1. Relationship between personal factors and knowledge of dairy farming

As indicated in Table 16, both communication skill and sharing available information with others were positively and significantly (at 0.01 level) associated with continuous variables of personal characteristics.

The positive and strong relationship between respondents' knowledge of dairy farming and communication skill implies that, the higher the communication skill, the higher will be their knowledge of dairy farming practices. This might be due to the fact that, the ability to express ideas or to listen attentively to others increases the individual's exposure to information.

The positive and significant relationship between the knowledge of dairy farming and sharing available information with other farmers also implies that, when women farmers' extent of sharing available information with others increases, knowledge of dairy farming also increases. The result of this study agrees with the study done by Asres (2005).

4.3.2. Relationship between socio-economic factors and knowledge of dairy farming

It could be observed from Table 16 that, there was significant correlation at 0.01 significant level and positive relationship between size of landholding and respondents' knowledge of dairy farming. This implies that when respondents' size of land holding increases, their knowledge of dairy farming also increases.

The probable reason might be that, more land enables farmers to increase production, which provides more income that can be used to buy farm inputs. Therefore, farmers who have relatively large farm size will be more initiated to practice improved technologies. This also

implies that respondents with large farm size seek many more new ideas, information and knowledge than those who have small landholding.

Findings of Nkonya *et al*. (1997) hinted that those with large farm are likely to be better informed, be able to take risk associated to experiment with new practices. Bezabih (1999), Ramasamy *et al*. (1999), Edlu (2006) and Yenealem (2006) have also indicated that farm size of crop land exerts a positive influence on the adoption of improved technologies.

Statistical analysis of Pearson correlation coefficient revealed that there was significant and positive relationship between knowledge of dairy farming and household annual income at 5% level of significance (r = 0.167, P= 0.036). This implies knowledge of dairy farming practices increases with increase in annual household income. The probable reason might be those respondents with a relatively higher annual income probably participate in technology packages and this in turn exposes them to get new information.

Many studies confirm that in addition to farm income, income obtained from off-farm and non-farm activities increase the probability of investing on new technologies (Chilot *et al*, 1996; Freeman *et al*, 1996; Van den Ban and Hawkins, 1996; Asfew *et al*, 1997; Habtemariam, 2004).

4.3.3. Relationship between situational factors and knowledge of dairy farming

Statistical analysis of Pearson correlation of field data shows that there is significant, positive and relatively strong relationship between knowledge of dairy farming and social participation. As a single variable, social participation has a significant influence on knowledge of dairy farming. This might be due to farmers who have some position or interaction in different informal and formal institutions or organizations are more likely to be aware of different types of new information.

This proves the hypothesis that social participation has a positive influence on agricultural information network output of farm women.

This study is in line with the findings of Ebrahim (2006), where he detected a positive relationship between social participation and adoption of dairy package.

There was significant and positive relationship observed between information seeking behavior and knowledge of dairy farming. This implies that, when the desire or eagerness of women to get information increases, the attempt for that will follow and their knowledge of dairy farming practices also increases.

The findings of this study agree with hypothesis assumed and with the study done by Asres (2005).

As shown in Table 15, there was highly significant and positive relationship between access to credit and knowledge of dairy farming. This might be because, access to credit has impact on level of utilization of recommended technological packages and this in turn will demand different information.

There was significant and positive relationship observed between knowledge of dairy farming and extension participation. This indicates that when women farmers' frequency of contact with development agents and frequency of participation on various extension activities increase, consequently knowledge of women farmers' regarding dairy farming practices also increases.

4.3.4. Relationship between psychological factors and knowledge of dairy farming

As indicated in Table 16, among six variables of psychological factors, three of them, positiveness, empathy and interpersonal trust were significant at 1% significance level and level of aspiration was significant at the 5% level of significance respectively, while other variables (achievement motivation and women's attitude towards DA) were statistically non significant.

A study conducted in Dire Dawa administrative council, eastern Ethiopia, Asres (2005) indicated that achievement motivation was statistically insignificant in access to reproductive, productive and community role information of women.

As is shown in Table 16, there is positive, significant and strong relationship between respondents' knowledge of dairy farming and interpersonal trust of respondents. This might be due to the fact that trusting individuals will be more likely than less trusting individuals to share information each other. Therefore, increase in interpersonal trust of women results in better sharing of information between respondents' and this leads the women to have better knowledge.

The result of the study revealed that there was significant and positive relationship between positiveness of respondent and knowledge of dairy farming. This might be probably because; the majority of women in the study area show better willingness to discuss agricultural matters with other farmers.

There was significant and positive relationship between level of aspiration of respondents and knowledge of dairy farming. However, the relationship was at 5% level of significance. The probable reason might be that, level of aspiration acts as a motivating factor to improve the activities to earn more for makes better life, which might tempt to seek new information and to gain more knowledge.

The study revealed that there was significant, positive and strong relationship between empathy of respondent and knowledge of dairy farming. This is because empathy connects people together with better interpersonal relationships and therefore it gives a chance to share information each other.

4.4. Influence of independent variables on agricultural information network output of farm women

4.4.1. Multiple Linear Regression Analysis

In the preceding parts of this thesis the descriptive analysis and bivariate analysis of important independent variables, which are expected to have influence on knowledge of dairy farming of women farmers were presented. In this section, the selected independent variables were put to Multiple Linear Regression (MLR) model to identify the factors influencing knowledge of dairy farming of women farmers. A MLR model was fitted to estimate the influence of the hypothesized independent variables. SPSS version 13 was used for analysis.

Based on bivariate analysis in the previous sections, among continuous variables, communication skill, sharing available information, annual income, size of land holding, social participation, information seeking behavior, extension participation, positiveness, empathy, interpersonal trust and level of aspiration are selected while among discrete variables only access to credit was selected for multiple regression analysis.

Prior to the estimation of the model parameters, it is crucial to look into the problem of multicollinearity or association among the potential candidate variables. To this end, the variance inflation factor (VIF) and condition index (CI) was used to test the degree of multicollinearity among the continuous variables and since access to credit is the only discrete variable, contingency coefficient test was not computed. Therefore, the variable was directly entered into MLR analysis

Table 17. Variance inflation factor (VIF) and condition index (CI) for continuous variables

Variables	VIF	Condition index
(Constant)		1.000
COMSKILL (X_1)	1.799	3.834
SHAROINFO (X_2)	1.818	4.323
TOTANINC (X_3)	1.202	6.729
SIZEOLAND (X_4)	1.377	7.623
SOCPARTN (X_5)	1.252	8.663
INFOSEKB (X_6)	2.000	10.819
EXTPART (X_7)	1.227	14.752
POSTNSS (X_8)	1.992	15.716
EMPATY (X_9)	2.035	17.018
INTPRTR (X_{10})	2.260	18.626
LEVELOAS (X_{11})	1.205	25.335

The values of VIF and CI for continuous variables were found to be less than 10 and less than 30 respectively. To avoid serious problem of multicollinearity, it is quite essential to omit the variables with VIF value greater than or equal to 10 and CI value greater than or equal 30 from the MLR analysis. Based on VIF and CI result, the data have no serious problem of multicollinearity. As a result, all the 11 continuous independent variables were retained and entered into MLR analysis (Table 17).

The variable knowledge of dairy farming was used as a continuous dependent variable. Eventually, a set of 12 independent variables (11 continuous and 1 discrete) were included in the model and used in the MLR analysis.

These variables were selected on the basis of theoretical explanation and the result of various empirical studies.

To determine the best subset of independent variables that are good predictors of the dependent variable, the MLR were estimated using SPSS. In this method all the above mentioned variables were entered in a single step.

Table 18. Coefficients of regression function

Variables	Coefficients		t	Sig.
	B	Std. Error		
(Constant)	-3.761	1.093	-3.441	.001
COMSKILL (X_1)	.194**	.046	4.213	.000
INTPRTR (X_{10})	.791**	.196	4.028	.000
SOCPARTN (X_5)	.132**	.046	2.866	.005
TOTANINC (X_3)	.000**	.000	2.945	.004
EXTPART (X_7)	.371**	.153	2.427	.017
EMPATY (X_9)	.660**	.293	2.253	.027
ACSSTCRE (X_{12})	1.765**	.841	2.098	.039

** Significant at 0.05 level

R= 0.855, R^2 = 0.730, Adj. R^2 = 0.707, F = 31.744, P = 0.000

Table 18 shows that, out of twelve factors considered in the model, only seven variables were found to be significantly influencing on women farmers' knowledge of dairy farming practices at 0.05 levels of significance. These variables include communication skill, interpersonal trust, social participation, total annual income of the household, extension participation, empathy of respondent and access to credit. Five of the 12 explanatory variables (See Appendix 5) were found to have no significant influence on women farmers' knowledge of dairy farming practices in the study area.

The multiple correlation coefficient measure (R=0.855) indicates that the relationship between knowledge of dairy farming and continuous independent variables is quite strong and positive.

The value of coefficient of determination (R^2) implies that about 73.0% of the variation in knowledge of dairy farming is explained by the independent variables in the model.

Table 19. ANOVA of the regression function

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1238.032	7	176.862	31.744	.000
Residual	456.868	82	5.572		
Total	1694.900	89			

ANOVA results in Table 19 shows that the regression is significant at less than 1 % level. The variables, derived as an out put of the model, are described below.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots\ldots + \beta_k X_k$$

Where: Y = Knowledge of dairy farming (KNOWORES)

X_1 = Communication skill of respondent (COMSKILL)

X_{10} = Interpersonal trust of respondent (INTPRTR)

X_5 = Social participation of respondent (SOCPARTN)

X_3 = Total annual income of the household (TOTANINC)

X_7 = Extension participation (EXTPART)

X_9 = Empathy of respondent (EMPATY)

X_{12} = Access to credit (ACSSTCRE)

$$KNOWORES = -3.761 + .194\ X_1 + .791\ X_{10} + .132\ X_5 + .000\ X_3 + .371\ X_7 + .660\ X_9 + 1.765 X_{12}$$

(4.231) (4.028) (2.866) (2.945) (2.427) (2.253) (2.098)

KNOWORES = -3.761 + .194 COMSKILL +.791 INTPRTR +.132 SOCPARTN .000 TOTANINC + .371 EXTPART + .660 EMPATY + 1.765 ACSSTCRE

The numbers in the parenthesis are calculated t-values of respective coefficient parameters. The out put of the model have been thoroughly discussed below.

Communication skill (COMSKILL): The results showed that as communication skill of respondent increased by 1 unit, knowledge of dairy farming would be increase by 0.194 units. This implies, when the ability of a woman to express ideas effectively to others and the ability to listen others attentively increases, her knowledge about the activities she was performing also increases.

Interpersonal trust of respondent (INTPRTR): We can see from the analysis that as interpersonal trust of the respondent increases by one unit, the level of knowledge of women farmers regarding dairy farming practices increases by 0.791 units. Therefore, the results of this study conform to our theoretical expectations concerning the effects of interpersonal trust in increasing the expected knowledge of women farmers. This means that other things being constant, interpersonal trust will lead to a greater readiness to take part in information exchange. This is because an individual's level of trust allows him or her to form expectations about the actions of others.

Benson and Rochon (2004) citing Coleman (1990) states, "a group whose members manifest trustworthiness and place extensive trust in one another will be able to accomplish much more than a comparable group lacking that trustworthiness and trust"

People who are more trusting others in their daily life may experience getting more knowledge than others, because trust gives one the incentive to actually take part in information exchange.

Social participation of respondent (SOCPARTN): Correlation analysis shows that social participation was positively and significantly correlated with knowledge of dairy farming. Similarly, the output of regression analysis proves that, as the involvement of women in various formal and informal institutions or organizations increases by one unit, knowledge of women of dairy farming is also increases by 0.132 units. This means that farmers who have some position in different informal and formal institutions or organizations are more likely to be aware of different type of new information.

Total annual income of the household (TOTANINC): In many studies, total annual income was taken as an important variable explaining the characteristics of households. In this study it was also assumed that, those who have earning relatively higher income could be participating in technology packages and this in turn will expose to get new information. Pearson correlation coefficient (r = 0.167, P= 0.036) revealed that annual income of the household was positively and significantly correlated with knowledge of dairy farming practice at less than 5% level of significance. But in the contrary to the assumption, the result of coefficient of model output (X_3 = 0.000) indicates that knowledge of dairy farming practices does not change with increase in annual household income.

Extension participation (EXTPART): As per the hypothesis, the relation between extension participation and knowledge of dairy farming was found to be positive and significant, as discussed in previous section. The output of the regression analysis (X_7 = 0.371) also confirmed the statement. One unit increment in extension participation would bring about 0.371 units increment in the knowledge of women farmers regarding dairy farming. This implies that, frequency of contacts or visits of extension agent to farmer is very important to up date the knowledge and skill of farmers on farm technologies, practices or activities. Thus, the availability of extension participation in the rural areas is of a paramount importance to farmers. Moreover, extension participation improves the knowledge and increases concern of farmers about agricultural activities.

Empathy of respondent (EMPATY): The study revealed that the coefficient of empathy of respondent (X_9 = 0.660) was positively and significantly correlated with knowledge of dairy farming signifying that holding the values of all other variables constant, a unit increase in an empathetic level of a respondent would be accompanied by an increase in the knowledge of dairy farming by 0.660 units. The probable reason might be that empathy connects people together and therefore it gives a chance to share information each other.

Access to credit (ACSSTCRE): According to the result, the coefficient of model output (X_{12} = 1.765) indicates access to credit was positively and significantly correlated with women's knowledge of dairy farming practice, a unit increase in access to credit would be accompanied

by an increase in the knowledge of dairy farming by 1.765 units. This means that increased access to credit increases utilization of recommended technological packages which exposes women farmers to different new information.

4.5. Constraints and opportunities of extension services in reaching out to rural women

4.5.1. Constraints in making extension service accessible to women farmers

Constraints are those factors adversely influencing agricultural information networks of farmwomen and factors that hinder extension service in reaching out to women farmers. This subsection covers many different issues such as women's participation in extension packages; number of extension packages used by women; reasons for not using extension packages, reasons for not participating in extension programmes, and reasons for not receiving credit; constraints on access to credit, constraints on package inputs and market; problems in contact with development agents, and problems on participation of farmers' organizations.

4.5.1.1. Participation in extension packages

It was tried to assess number of extension packages used by women farmers' and reasons for not using different types of packages. Dominantly produced extension packages available in the study area were crop, coffee, horticulture, dairy, fattening, and poultry packages. The findings are presented in Table 20 & 21.

Table 20. Distribution of sample respondents based on their usage of packages & number of packages used

No	Attributes	Frequency	Per cent
	Extension package utilized (N=160)		
1	No	125	78.1
2	Yes	35	21.9
	Total	160	100.0
	Number of extension packages used (N=35)		
1	One package	20	57.1
2	Two packages	9	25.7
3	Three packages	4	11.4
4	Four packages	2	5.7
	Total	35	100.0

Table 20 shows that, out of the total respondents interviewed, 78.1% have not participated in any of the available extension packages in the study area, while only 21.9% were participated in extension packages. However, among the participants 12.5%, 5.6%, 2.5%, and 1.3%, utilized 1, 2, 3, and 4 combinations of the available extension packages respectively.

There are number of reasons why women farmers have been restricted to practice only one, two or more packages or reasons for not using extension packages. Comparative advantage, specialization or some other reasonable rationales might have lead farmer to be selective in choice of packages. However, some socio-economic and other factors also influence farmers' ability to use or not the combination of packages and elements of specific package together. There was no respondent that utilized all the six combination of packages together. Accordingly substantial variability exists in package utilization among women farmers. This variability is due to lack of money (unable to pay down payment or repay the previous loan), no extension contact with development agents and scarcity of farm land, unavailability of input, lack of interest to participate in extension packages, lack of knowledge, lack of labour and lack of guidance by DA, in descending order of importance(Table 21).

Table 21. Distribution of sample respondents based on their reasons for not using extension packages

No	Response	Crop package (N=137)		Coffee package (N=150)		Horticulture package (N=147)		Dairy package (N=154)		Fattening package (N=160)		Poultry package (N=155)		Score	Rank
		N	%	N	%	N	%	N	%	N	%	N	%		
1	Lack of money	33	24.1	30	20.0	6	4.1	56	36.4	65	40.6	19	12.3	209	1st
2	Shortage of land	28	20.4	42	28.0	42	28.6	6	3.9	1	.6	-	-	119	2nd
3	No extension contact	19	13.9	20	13.3	17	11.6	12	7.8	11	6.9	24	15.5	103	3rd
4	Unavailability of input	9	6.6	11	7.3	8	5.4	5	3.2	7	4.4	57	36.8	97	4th
5	Lack of interest to participate	13	9.5	16	10.7	10	6.8	6	3.9	18	11.3	6	3.9	69	5th
6	Lack of knowledge	3	2.2	1	.7	25	17.0	6	3.9	12	7.5	10	6.5	57	6th
7	Lack of labour	6	4.4	11	7.3	11	7.5	12	7.8	13	8.1	2	1.3	55	7th
8	Lack of guidance by DA	4	2.9	4	2.7	12	8.2	12	7.8	10	6.3	10	6.5	52	8th
	Lack of down payment	4	2.9	6	4.0	1	.7	13	8.4	7	4.4	16	10.3	47	9th
9	Lack of credit	3	2.2	5	3.3	-	-	11	7.1	7	4.4	4	2.6	30	10th
10	High input cost	6	4.4	2	1.3	1	.7	11	7.1	2	1.3	-	-	22	11th
11	Extension package is tedious	1	.7	-	-	2	1.4	4	2.6	6	3.8	6	3.9	19	12th
12	Unable to repay the previous loan	1	.7	1	.7	6	4.1	-	-	1	.6	-	-	9	13th
13	It is not profitable	4	2.9	-	-	4	2.7	-	-	-	-	-	-	8	14th
14	Other reasons	3	2.2	1	.7	2	1.4	-	-	-	-	1	.6	7	15th
15	Total	137	100	150	100	147	100	154	100	160	100	155	100		

Women farmers were asked to identify constraints on access to credit, on access to package input and market of products. Unavailability on time and lack of collateral were constraints suggested by respondents on access to credit. Poor quality of breed and less extension support were some of the problems regarding access to inputs. On the other side, distance of market place and being unable to get alternative market for products were problems of rural women farmers in the study area.

Table 22. Problems in contact with development agents

No.	Attributes	Frequency	Percent
	Reasons for not contacting extension agent (N=67)		
1	No agent nearby	14	20.9
2	No need for service	11	16.4
3	Other reasons	42	62.7
	Total	67	100.0
	Reasons for not receiving credit (N=151)		
1	Fear of inability to repay	29	19.2
2	High interest rate	4	2.6
3	Lack of collateral	1	0.7
4	No credit service	55	36.4
5	No need of credit	55	36.4
6	Other reasons	7	4.6
	Total	151	100.0

As shown on Table 22, the major problems in contact with development agents were the absence of development agents nearby (20.9%), no need for extension service (16%), and some other reasons (62.7%). Some of the reasons are, most of DAs are male and because of that they approach male farmers; DAs does not consider women as farmers; more of the extension packages are male targeted; women are busy at home; women have no decision power on taking inputs or other technologies. On the other hand, the absence of credit service and no need for credit were equally important (36.4% each) reasons for not receiving credit in the study area. No need of credit might be due to fear of inability to repay the credit, because as discussed previously this problem contributes about 19.2% as reason for not receiving

credit and even though there was credit, it was unavailable on time . Other problems such as high interest rate, lack of collateral and some other reasons collectively hold 7.9%.

To conclude, there is poor access to credit and the majority of the households were not utilizing the credit in the study area.

Participation in extension programmes enables farmers to identify their farm problems and to set sound solutions for further measure. As we have discussed in previous sections, majority of women were not participating on extension activities. The reasons for not participating in extension programmes are presented in Table 23.

Table 23. Reasons for not participating in extension programmes

No	Extension programmes	N	Not invited		No interest in the program		Other reasons	
			N	%	N	%	N	%
1	Extension planning	147	141	95.9	6	4.1	-	-
2	Extension training	147	142	96.6	4	2.7	1	.7
3	Farmers' field day	150	146	97.3	3	2.0	1	.7
4	Demonstration & on-farm trial	148	141	95.3	5	3.4	2	1.4
5	Extension exhibition	158	153	95.6	5	3.2	-	-

According to the survey result, more than 95% of women farmers in the study area were not invited by development agents in order to participate in any extension activities such as extension planning, training, farmers' field day, demonstration & on-farm trials and extension exhibitions.

The probable reason might be, most of the time male farmers were invited to participate in extension programmes. However, males were not transferring the message to their wives as indicated by the respondents during the group discussion. But still women are highly involved in agricultural activities without having information. A survey conducted in Burkina Faso,

(DFID, 1999) reflected that, only one percent had heard of the technologies from their husbands. Men are less likely to pass on information to their wives when crops and tasks are gender specific.

To rate the constraints of the extension organization (WOoARD), in reaching out to women with regard to dairy farming, suggestions was collected through informal interview from DAs and concerned SMSs' and respondents were asked to rate the importance of the constraints among the list of twelve of constraints.

The rank orders of the constraints were identified through using score values of the constraints. The constraint that got the highest score value was taken as the most important constraint that hinder the extension organization from reaching rural women with regard to dairy farming.

Table 24. Rank order of constraints obtained from informal interview with DAs and SMSs' (N= 24)

Constraints	Importance of the constraints			Score	Rank
	Not important (1)	Somewhat important (2)	Very important (3)		
Lack of organizational policy to address women	0	3	21	69	1st
Lack of follow-up after extension programs	0	6	18	66	2nd
Lack of training programs on dairying topics	0	6	18	66	2nd
Lack of means of transport for DAs	0	6	18	66	2nd
Women's busy schedule at home	3	3	18	63	3rd
Low participation of women in extension activities	0	9	15	63	3rd
Absence of special programmes focusing on women	3	3	18	63	3rd
Lack of market system and market information on milk and milk products	3	6	15	57	4th
Lack of up-to-date technical knowledge for DAs	6	6	12	54	5th
Lack of female DA	3	15	6	51	6th
DA busy schedule of other work	12	9	3	48	7th
Cultural inhibition of women to contact male DAs	9	9	6	45	8th

As indicated in Table 24, among the twelve constraints, lack of organizational policy to address women is the most important constraint and cultural inhibition of women to contact male DAs is rated as the least important constraint.

This issue was discussed in detail with SMSs of the organization (WOoARD) who also agree in addressing women as important, but the problem is that it is not in practice. On the other hand, the issue of cultural inhibition of women to contact male DAs was discussed in detail with both women and men group members during focus group discussion, but they also agreed that this constraint was minimal. So, the finding indicates the need to frame gender sensitive

policies to address women in agriculture, particularly on the tasks in which they play vital roles.

4.5.2. Opportunities of extension services in reaching out to rural women

There are many possibilities in the study area to reach women farmers, in order to make them involved in development activities. Some of these are discussed here.

Development Agents, who live with the farmers, appreciate farmers' problems, provide new technologies, and having close supervision, are essential partners for bringing agricultural development in the area. The number of DAs in the study area is increasing gradually. All PAs have DAs assigned, now in most of the PAs there are three diploma holder DAs, one each in the areas of crop production, livestock production and natural resource management, and most of them are ATVET graduates. This could be an opportunity to increasingly reach farmers seeking extension services. However, it is not a matter of the presence of DAs in their vicinity; rather the issue is having good contact, getting advice, and benefiting from their advice. As discussed in the earlier sections, from the sampled respondents, 58.1 % of the households have contact with agents and get information about dairy farming practices. But this is not true for all farmers since 41.9 % didn't have any contact with DAs.

The insufficient number of female extension workers was one of the problems observed in the extension services. Lack of education and opportunities for the girls in rural areas contribute to limited number of female extension professionals. Now, many parents realized that their daughters' education as one of their main goals. This problem has been recognized by the Government, and as a result, enrollment rate of girls increased. Female extension workers graduated from ATVET colleges were also assigned in the surrounding PAs in the study area. When this research was conducted, the number of female extension workers was thirteen. Even though, the number was too little, it was promising for the future strength of extension service in the study area.

According to the national plan, extension services in the future will be centered on the use of farmer training centers (FTCs). Based on this plan, Dale WOoARD planned to establish FTCs throughout the *Woreda*. There is about one FTC at each PA. Almost every PA in the *Woreda* has started to construct FTCs. Some PAs have already constructed the required number of FTCs. Even though, most of the FTCs have not been fully equipped yet, some of them have started training farmers. The FTCs are expected to serve as centers of extension service and information, places where modular training to farmers of up to 6 months are given, centers of demonstration of entrepreneurship, and as a source of advice on projects.

Women's mutual support networks or informal institutions such as *eqoub, idir* and *mahiber* are very widespread in rural areas, involving both men and women; provide a wide variety of services and benefits. They serve as forums for the exchange of experience and of information, for example, about market behaviour, the movement of goods and of prices, etc., both of which may have economic significance. They are a potential means of independent economic viability particularly for women. According to Desalegn (1991), such social networks provide solidarity to individuals. The networks also empower them to use some of the services of the information.

Lack of education opportunities for DAs contribute to poor extension services in the area. The problem also has been recognized by the Government, and as a result, a number of DAs were sent to ATVET colleges. Out of the total 119 DAs, 48 (40.3%) have (5 female & 43 male) joined ATVET colleges in the year 2005/06. This indicates that, WOoARD has given due attention to upgrade the level of education of DAs.

At present, most of the information flow reaching women farmers works through the oral information system. It is very important not to regard the oral information system as separate or opposed to the print-based information system. A lot of the knowledge needed by the community will be found and taken (used) from the oral information system.

Sidama Zone has a community radio which is stationed at Yirgalem town, capital of Dale *Woreda.* Out of the total farm women interviewed, 49.4% are illiterates. Therefore,

communicating adequate information to this group is essential because these members have a big contribution to make in the development process of the community. Community radio is particularly useful for this purpose because its programmes have a lot of local content. Women's groups can meet in the house of one of their members on a rotational basis to hold discussions, listen to a radio programme. In this way, they can participate in the activities of the agricultural extension services.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary

Ethiopian rural women make significant contribution to subsistence agriculture and to ensuring food security and are the mainstay of the farm labor. They work in all aspects of agriculture. In addition to their active engagement in agriculture and livestock production, women are responsible for all household chores, mainly as a result the gender division of labor.

Despite their immense contribution to the household economy and given their critical role in determining, guaranteeing food security as food producers, food providers and contributors to household nutrition and security, rural women often face difficulties than men in gaining access to agricultural information to increase their production and productivity.

Knowledge or information is becoming one of the most important factors of production, and there is no doubt that this trend will intensify. Having timely and relevant information can fundamentally alter people's decision-making capacity and is critical to increasing agricultural productivity. It is often difficult for rural people to obtain relevant and timely information. It is also difficult for rural communities to share information beyond face-to-face contact, thus inhibiting access to information available outside their locality.

Women in the agricultural sector in SNNPR already face many socio-economic, educational and institutional obstacles to realizing their full potential. They also lack appropriate and usable information that could help them with their farming activities. They need information on a wide range of subjects, including agricultural production, processing, marketing and the natural resource base. Dairy production is one of the major areas of activities where women farmers participate in the study area.

Information is said to be a resource that must be acquired and used for the improvement of agricultural production. The sharing of ideas and information forms a large part in extension agents' job. Having adequate well-presented information will improve the efficiency of rural development projects and programmes.

No study has been conducted in Southern Ethiopia on agricultural information flow to farm women in relation to their knowledge of dairy farming practices. Therefore, this study is intended to analyze the agricultural information network of farm women; to identify factors influencing farm women's information network output in terms of knowledge and to identify the constraints and opportunities of extension services in reaching out to women.

The study was conducted in Dale *Woreda,* Southern Ethiopia. The *Woreda* was selected purposively with certain criteria.

To address the objectives of the study, both quantitative and qualitative methodologies were used in this study. Data were collected from primary and secondary sources. The primary data necessary for the quantitative study were collected through personal interviews from 160 women farmers drawn from four PAs by conducting formal survey using structured interview schedule. Qualitative data were collected through field visits, observations, informal interview with key informants, Village leaders, DAs, SMSs, NGO workers and extension officials; discussion with separate focus groups of women and men farmers. This study uses a three stage sampling procedure in which both purposive and random sampling techniques were used to select the PAs and sample respondents. Descriptive statistics with appropriate statistical tests and Multiple Linear Regression model were used to analyze data collected for the study.

The results of the study revealed that the average age, land holding, family size, and annual income were found to be 35.81 year, 0.41 ha, 6.39, and 1421.04 Birr respectively.

The survey result shows that, neighbors or friends, other farmers (other than neighbors or friends), DAs, and WOoARD were the most important, close and frequently used sources of information for women farmers in the study area. Respondents perceived that NGOs, leaflets

& folders and training, demonstration & field days as the least important sources of information on dairy farming. The information from DAs, farmers (other than neighbors or friends), WOoARD and rural radio programs were the 1st to 4th most valuable sources of information respectively.

Correlation analysis of the relationship between independent variables and knowledge of dairy farming shows that communication skill, sharing available information with others, size of land holding, social participation, information seeking behavior, extension participation, positiveness of respondent, empathy of respondent, interpersonal trust of respondent, total annual income and level of aspiration of respondent were observed to have positive and significant relationship with knowledge of dairy farming.

Dominantly produced extension packages available in the study area were crop, coffee, horticulture, dairy, fattening, and poultry packages. Out of the total farm women interviewed, 78.1% have not participated in any of the available extension packages in the study area. Comparative advantage, specialization or some other reasonable rationales might have lead farmer to be selective in choice of packages. However, some socio-economic and other factors also influence farmers' ability to use or not the combination of packages and elements of specific package together. According to the result of the study, substantial variability exists in package utilization among women farmers. This variability is due to lack of money (unable to pay down payment or repay the previous loan), scarcity of farm land, no extension contact with development agents and unavailability of input, lack of interest to participate in extension packages, lack of knowledge, lack of labour and lack of guidance by DA in ascending order.

There was poor access of credit and the majority of the respondents were not utilizing the credit in the study area. Unavailability on time and lack of collateral were constraints suggested by respondents on access to credit. Poor quality of cow breeds and lack extension support were some of the problems regarding access to inputs. On the other side, distance of market place and being unable to get alternative market for products were problems of rural women farmers in the study area.

According to the findings of the study, 58.1% of the farm women have contact with DAs while 41.9% have no contact with DAs. Among women farmers those who have contact with DAs, more than half (61.3%) in the study area were less frequently contact with DAs. In general, agricultural extension services still do not serve to reach women farmers or women on farm in the study area.

The major constraints identified in agricultural information network of farm women were low participation of women in extension packages and extension programmes; poor access to credit; distance of market place and absence of alternative market for products; low contribution of DAs, WOoARD, extension methods as source of information in the study area.

The regression output of the study indicates that knowledge of dairy farming practice of women farmers was significantly influenced by communication skill, interpersonal trust, social participation, extension participation, empathy of respondents, access to credit and total annual income in descending order.

5.2. Conclusion and Recommendations

The study found that neighbors or friends and other farmers (other than neighbors or friends) were the most important, close and frequently used sources of information for women farmers in the study area, while NGOs and extension methods such as leaflets, folders, training, demonstration and field days were perceived by respondents as the least important sources of information on dairy farming. Therefore, it is recommended that DAs, professional experts, administrative bodies, planners and related organizations first should consider the impact and influence of informal sources of agricultural information. Actors such as farmers or villagers, who are sometimes seen as 'beneficiaries' or 'target groups', become essential as source of information in the information exchange of the extension system. Secondly they should understand farmers' situation and design appropriate extension communication methods to fill the information gap and fit conditions of different categories of farmers, particularly women farmers.

Findings of this study indicate that participation of women farmers in various areas of extension programmes was very low in the study area. Agricultural extension services should no longer continue considering women as housewives and mothers only, focusing mainly on male farmers. Improving participation of women farmers in various areas of extension programmes is the best option for empowering farm women for better networking of agricultural information. Therefore, it is recommended that, training programmes should be organized and conducted based on women's need, in a manner that women are encouraged to attend, taking into consideration timing, duration, location and language; in any training organized for farmers, at least 30% should include women farmers.

In the study area, about half of the respondents have no contact with DAs; this implies that the linkage between the women farmers and the DAs is very weak. The technical assistance women farmers are acquiring from the DAs with respect to dairying is very limited. Therefore, it is recommended to train more female DAs especially in areas with dairy management to up-date their technical knowledge on dairy farming or orient and sensitize male extension workers towards women farmers and their needs to make them more responsive.

The study also revealed that women farmers faced various constraints such as lack of access to credit which is associated with inability to meet down payment requirements or repay the previous loan; unavailability of credit on time; lack of alternative markets and market information for their products; lack of participation in formal institutions like farmers cooperative and PA. Instead, majority of rural women in the study area participate in informal local institutions such as *ekub*, *edir* or *mahber* and religious organizations. Therefore, it is recommended that improving access to credit by strengthening local micro-finance institutions and lowering down payments to enhance participation of women farmers; enhancing women's participation in formal institutions like cooperatives by improving the involvement of women in formal institutions or organizations; organizing women as milk producers cooperatives or self help groups for mutual support and exchange of business ideas, building solidarity, etc.; providing timely market information. It is also recommended that, reorienting community rural radio programs and organizing women in radio listening groups for sharing their knowledge.

Information should be made available at all levels. WOoARD also has to disseminate information (technical and gender related). e.g. in the form of leaflets, training aids, community radio, field visit, etc.; specific type of information that women seek need to be identified; sex disaggregate data need to be collected, documented, disseminated and used.

Psychological factors of respondents like interpersonal trust and empathy should be considered as factors on the extension services. DAs, professional experts and extension planners, also should give due attention and understand the impact and influence of those factors in the extension system.

Rural women are confined to their localities, so they can not go far from their localities. FTCs are best and suitable institutional mechanisms to reach farm women. Therefore, FTCs should have special, women oriented programs. A policy guideline may be framed at national or regional levels to evolve special formal or informal trainings focusing on women in all sectors where they play major roles. These sectors may include dairying, poultry, horticulture, post-

harvest technology, health & sanitation, balanced nutrition, family planning, HIV/AIDS and other issues.

In general, appropriate intervention strategies are needed in order to make agricultural extension services effective and to bring about equitable and sustainable changes in the study area.

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7. APPENDICES

Appendix I Interview Schedule

I. General Instructions to Enumerators

- Make brief introduction to each farmer before starting the interview, get introduced to the farmers, (greet them in the local way) get her name; tell them yours, the institution you are working for, and make clear the purpose and objective of the study.
- Please ask each question clearly and patiently until the farmer understands (gets your point).
- Please fill up the questionnaire according to the farmers reply (do not put your own opinion).
- Please do not try to use technical terms while discussing with farmer and do not forget to record the local unit.
- During the process put the answer of each respondent both on the space provided and encircle in the choose

Identification Number (code) ----------

Peasant Association name ----------

Name of enumerator----------

Date of interview----------

I PERSONAL FACTORS

1. Name of the respondent _____
2. Age of respondent _____
3. Marital status 1= Single 2= Married 3= Divorced 4=Widowed
4. Education level 0= illiterate
   1= can read & write
   2=primary school (grade 1-6)
   3= secondary school (grade 7-12)
5. Total number of household members (family size) ----------

SN	Name of family members	Relationship to the respondent[(a)]	Age	Gender 1: M 2: F	Education level[(b)]
1					
2					
3					
4					
5					
6					
7					
8					
9					

[(a)] Relationship: 1: Husband 2: Son 3: Daughter 4: Relative 5: Raised 6: Other

[(b)] Education level: 0= illiterate 1= read & write 2=primary school 3= secondary school

6. Communication skill

	Reception skill	**Always**	**Sometimes**	**Never**
	When another farmer describes the matters regarding dairy farming			
6.1	Do you listen it carefully?	(2)	(1)	(0)
6.2	Do you become impatient when the other farmer speaks too much?	(0)	(1)	(2)
6.3	Do you interrupt him before he finishes the matter?	(0)	(1)	(2)
6.4	Do you try to guess the matter before he starts talking?	(0)	(1)	(2)
	Processing skill (Translation, Interpretation, Extrapolitation)			
6.5	When another farmer tells you the agricultural methods to make dairy farming profitable, do you try to make it out in your own way/	(2)	(1)	(0)
6.6	When you get an information about a new method of farming do you use to think about its' feasibility in your field conditions and your surroundings?	(2)	(1)	(0)
6.7	When you understand a new method of farming from another farmer, will you be able to predict its results in advance, if you apply that practice in your own field?	(2)	(1)	(0)

	Expression skill	Always	Sometimes	Never
	When you disseminate some agricultural information to another farmer, to what extent you insist on the following points.			
6.8	Make sure to say only the accurate information to the possible extent	(2)	(1)	(0)
6.9	Speak in an easily understandable way without any block or obstruction	(2)	(1)	(0)
6.10	Without creating a feeling of enforcement, try to convince the other farmer	(2)	(1)	(0)
6.11	Explain the ideas with creation of a feeling of honesty in communication	(2)	(1)	(0)
	Feedback orientation			
6.12	When you describe any information on farming to another farmer, do you try to elicit questions from him?	(2)	(1)	(0)
6.13	When the other farmer asks questions do you feel happy in getting an opportunity to explain it further?	(2)	(1)	(0)
6.14	If the other farmer asks doubts again and again, do you try to convince him to the maximum extent without showing any displeasure?	(2)	(1)	(0)
6.15	Even if you encourage questions from the other farmer and he does not react, do you probe further to ascertain whether he understood it or not?	(2)	(1)	(0)

No.	7. Interpersonal trust	Always	Sometimes	Never
7.1	When you describe about new agricultural information to another farmer, do you think that he believes you completely?	(2)	(1)	(0)
7.2	In you perception, does the other farmer have only good opinion about you capability to explain it?	(2)	(1)	(0)
7.3	When the other farmer conveys information regarding agriculture to you, do you think that he may try to mislead you?	(0)	(1)	(2)
7.4	When the other farmer explains about new methods of farming, do you think he does not possess the qualification to describe those matters to you?	(0)	(1)	(2)

No.	8. Positiveness	Always	Sometimes	Never
8.1	Do have the willing to discuss the matters of agriculture with any category of farmers?	(2)	(1)	(0)
8.2	Do you ever feel that there is no point in discussing the agricultural matters with farmers?	(0)	(1)	(2)
8.3	Do you feel proud you when you discuss agricultural matters with other farmers?	(2)	(1)	(0)
8.4	Do you feel as your duty to convince other farmers on various aspects of Sheep fattening?	(2)	(1)	(0)

No.	9.Empathy	Always	Sometimes	Never
9.1	When do you speak about agricultural matters to other farmers, do you imagine in terms of "You were in his position"?	(2)	(1)	(0)
9.2	When you communicate an information regarding dairy farming to another farmer, if the farmer mentions his problems that are coming in the way of adopting that technology *(choose one appropriate response)* 1. You get angry and irritated 2. You consider it an escapism and leave him 3. You try to understand his problems and make necessary alternative solutions		(0) (1) (2)	

II SOCIO-ECONOMIC CHARACTERISTICS

10. Do you own land? 1= Yes 0= No

11. If yes, total land size covered by all crops (in timad) _____

12. Number of livestock owned at present

SN	Kind of livestock	Crossbred	Local breed	Total
12.1	Oxen			
12.2	Cow			
12.3	Young bulls			
12.4	Calves			
12.5	Heifers			
12.6	Sheep	-		
12.7	Goats	-		
12.8	Chicken			
12.9	Horse	-		
12.10	Mule	-		
12.11	Donkey	-		

13. Annual income from off-farm, non-farm and farm activities (in birr)

SN	Income from off-farm activities		SN	Income from non-farm activities		SN	Income from farm activities	
13.1	**Off-farm activities**	**Amount in Birr**	**13.2**	**Non-farm activities**	**Amount in Birr**	**13.3**	**Farm activities**	**Amount in Birr**
13.1.1	Wage labour ✪		13.2.1	Handicraft		13.3.1	Crop sale	
13.1.2	Others, specify		13.2.2	Petty trading		13.3.2	Vegetable sale	
			13.2.3	Fire wood and charcoal selling		13.3.3	Coffee sale	
			13.2.4	Brewing		13.3.4	Chat sale	
			13.2.5	Others, specify		13.3.5	Sales of chicken	
						13.3.6	Sales of eggs	
						13.3.7	Sales of milk	
						13.3.8	Sales of cheese	
						13.3.9	Sales of butter	
						13.3.10	Sales of hide & skin	
						13.3.11	Sales of calves	
						13.3.12	Sales of heifer	
						13.3.13	Sales of oxen	
						13.3.14	Sales of cow	
						13.3.15	Sales of sheep	
						13.3.16	Sales of goat	
						13.3.17	Others, specify	
	Subtotal							

✪Income earned as wage labour, if any family member engaged in any off-farm activities.

14. Do you have a radio? (*Radio ownership*) 1= Yes 0= No

15. If yes, which program do you listen to mostly? (Rank according to their importance)

	Rank
Agricultural program	( )
News	( )
Drama	( )
Music	( )
Others (specify) _____	( )

16. Why 1st ranked program is the most important to you? _____

17. How far your residence from the nearest town or city? _____ km. or ____ hours when walking on foot.

18. How frequently do you visit the nearby town or city? *(Cosmo politeness)*

1. Daily (4)
2. Most often (3)
3. Once a week (2)
4. Sometimes (1)
5. Never (0)

19. What is the purpose of the visit?

1. Agricultural related like purchase/shopping/marketing (4)
2. To visit friends/relatives (3)
3. To get medical treatment (2)
4. Entertainment (1)
5. Any other purpose (specify) _____

III SITUATIONAL FACTORS

20. Are you involved in any activities of formal and informal institutions/ Organizations in your area? (*Social participation*) 1= Yes 0= No

21. If yes, type of institutions/ Organizations & type of membership

SN	Organization/ institution	Weight	Measures used Maximum score = 36
21.1	Farmers cooperatives/union	10	Leader = 10 Office bearer/ committee = 7 Member only = 5
21.2	Peasant association	8	Leader = 8 Office bearer / committee = 6 Member only = 4
21.3	Women's association	7	Leader = 7 Office bearer / committee = 5 Member only = 3
21.4	Religious organizations (Mosque/ church)	5	Leader = 5 Member only = 3
21.5	Informal associations (Idir, Ekub. Mahber)	4	Leader = 4 Member only = 2
21.6	HIV club	2	Leader = 2 Member only = 1

22. If yes, type of institutions/ Organizations and frequency of participation in activities.

SN	Organization/ institution	★Frequency of participation
22.1	Parent committee in school	
22.2	Farmers cooperatives	
22.3	Religious organizations (Mosque/ church)	
22.4	Informal associations (Idir, Ekub. Mahber)	
22.5	Peasant association	
21.6	Women's association	
21.7	HIV club	
21.8	Others (Specify)	

★ Frequency of participation: 0= Never 1= Sometimes 2= whenever conducted

23. With whom do you share the information you have about livestock management?

SN	Type of information	Whom you share ✪ *(can have more than one response)*
1	Selection criteria for dairy animal	
2	Feeding	
3	Watering	
4	Cleaning barn	
5	House construction	
6	Supplemental feed preparation	
7	Storage of feed	
8	Health care	

✪1= Neighbors 2= Friends/ relatives 3= Husband 4= other family members 5= others

IV PSYCHOLOGICAL FACTORS

How much and how frequently do you seek information in the following activities? (Information seeking behavior)

Activities	SN	24. How much new information you wish to get	SN	25. Frequency of seeking information
Selection criteria for dairy animal	24.1		25.1	
Feeding	24.2		25.2	
Watering	24.3		25.3	
Cleaning barn	24.4		25.4	
House construction	24.5		25.5	
Supplemental feed preparation	24.6		25.6	
Storage of feed	24.7		25.7	
Health care	24.8		25.8	

Amount of new information wish to get: 0= No information 1= some information 2= All information

Frequency of seeking information: 0= Never 1= Rarely 2=sometimes 3= mostly

26. How is your feeling to achieve something? (Achievement motivation)

26.1	Success brings relief or further determination & not just pleasant feeling	Agree (3)	Undecided (2)	Disagree (1)
26.2	How true it is to say that your efforts are directed towards success	True (3)	Not sure (2)	Not true (1)
26.3	How often do you seek opportunity to excel?	Always (2)	Sometimes (1)	Never (0)
26.4	Would you hesitate to undertake something	Never (3)	Sometimes (2)	Always (1)
26.5	In how many sphere that might lead to your failing?	Mostly (1)	Sometimes (2)	Never (3)
26.6	How many situations do you think you will succeed in doing as well as you can?	Mostly (2)	Sometimes (1)	Never (0)

Source: Pareek U. and T.V. Rao, 1992

27. How your desire or ambition is strong to achieve something? (Level of aspiration)

(The items should be answered on 'yes'/'no' responses)

27.1 Do you feel that a farmer can lead prosperous life even in the profession of farming if he does hard work? Yes= 2 No= 0

27.2 You are being provided an opportunity to attend a tour for familiarizing you with the new techniques of farming. Will you be prepared to spend some money to attend the tour? Yes= 2 No= 0

27.3 Your son/daughter wants to attend young farmers training course at Hawassa University, College of agriculture for three months. Would you work more in his absence? Yes= 2 No= 0

27.4 Do you feel satisfied with your present method of farming? Yes= 2 No= 0

27.5 If you do not have sufficient finance, would you like to borrow them for making permanent improvements on your farm? Yes= 2 No= 0

27.6 Good crops can only be obtained from improved seed. Suppose improved seed has been provided to you at some higher rate than the local seed, will you purchase it? Yes= 2 No= 0

27.7 Crops should be sown at proper time but sometimes it becomes difficult to get labor at peak season, Will you sow your crops at proper time even if you have to pay high wages to laborers? Yes= 2 No= 0

27.8 Experts are of the opinion that green manuring is essential to maintain the fertility of the soil and its effect lasts for several years. Will you do green manuring knowingly that you have to sacrifice your crops for one season? Yes= 2 No= 0

27.9 Scientists at University, Hawassa have obtained Maize yield about 40 quintals per hectare. Do you think that farmers can also do the same? Yes= 2 No= 0

28. To what degree do you agree on the following statements? (Rural women's attitude towards Development Agents)

SN	Statements	Measurement Scale				
28.1	To bring about substantial improvement in agricultural production , it is a necessary to retain frequent contact with DAs	Strongly agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly Disagree (1)
28.2	Discussing the agricultural matters with DAs is merely a waste of time	Strongly agree (1)	Agree (2)	Undecided (3)	Disagree (4)	Strongly Disagree (5)
28.3	I am proud that, help and co-operation from DAs is plentiful	Strongly agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly Disagree (1)
28.4	I think it is of no use to discuss the agricultural matters to DAs, because they are not interested in women farmers	Strongly agree (1)	Agree (2)	Undecided (3)	Disagree (4)	Strongly Disagree (5)
28.5	DAs give special consideration to women farmers to improve our situation	Strongly agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly Disagree (1)
28.6	DAs fail to recognize women as farmers	Strongly agree (1)	Agree (2)	Undecided (3)	Disagree (4)	Strongly Disagree (5)

V EXTENSION SERVICE RELATED FACTORS OF RURAL WOMEN

29. Did you have any contact with Development agent in your area? 1=Yes 0= No

30. If yes, frequency of contact?

Once in a week (4)

Once in two weeks (3)

Once in three weeks (2)

Once in four weeks (1)

31. If no, why? 1= No DA nearby 2 = No need for service

3 = Others (specify)

32. What types of service most of the time you are getting from DAs

1. Technical support
2. Theoretical information
3. Input Supply
4. Experience sharing
5. Others specify_____.

33. Do you have access to credit? 1= Yes 0=No

34. Did you receive credit last year? 1= Yes 0=No

35. If yes, from where do you get the credit services?

1= Bank 2= NGO 3= Microfinance institute

4 = Local money lender 5 = Service cooperatives 6 = Others (specify)

36. If no, why? 1= Fear of inability to repay 4 = No credit services

2 =High interest rate 5 = No need of credit

3 =Lack of collateral 6 = Others (Specify)

37. For what purposes you have obtained the credit?

1= Purchase of industrial by-product
2= Construction of dairy cattle house
3= Purchase of crossbreed dairy cow
4= To fill up family requirement
5= To settle debts
6= For growing crops
7. Others

38. Have you ever participated in extension planning last year?

1=Yes 0 =No

39. If no, why?

1. Not invited to participate
2. No interest in the program
3. Others specify_____

40. If yes, in what area of planning you have participated?

1. Evaluation of the past year achievement
2. Current Situation analysis
3. Problem identification
4. Setting alternative solution
5. Setting plan
6. Others specify, _____

41. What was your contribution in extension planning?

1. Information supply
2. Need specified
3. Listener
4. Others specify_____

42. Have you ever participated in extension training last year?

1=Yes 0=No

43. If yes, in what area of extension training you have participated? (put ✓ mark on the space provided)

SN	43.1 Crop production	SN	43.2 Livestock production	SN	43.3 Natural resource management	SN	43.4 If other
43.1.1	General_____	43.2.1	General_____	43.3.1	General_____	43.4.1	_____
43.1.2	Sowing and planting_____	43.2.2	Feeding_____	43.3.2	Physical conservation___	43.4.2	_____
43.1.3	Weeding_____	43.2.3	Management___	43.3.3	Biological conservation___	43.4.3	_____
43.1.4	Crop protection____	43.2.4	Housing_____	43.3.4	Surveying _____	43.4.4	_____
43.1.5	Harvesting and storing_____	43.2.5	Health care____				

44. How frequently did you get the training?

1. Once per month
2. Once in 3 month
3. Once per year
4. Others

45. If no, why?

1. Not invited to participate
2. No interest in the program
3. Others specify _____

46. Have you ever attended any farmers' field day last year?

1=Yes 0=No

47. If no, why?

1. Not invited to participate
2. No interest in the program
3. Others specify_____

48. Have you ever hosted, extension demonstration, or on farm experiments on your field last year?

1. Yes 2. No

49. If not, why?

1. Not invited to do
2. Not interest in the program
3. Others specify_____

50. Have you ever participated in extension exhibition last year?

1=Yes 0=No

51. If not, why?

1. Not invited to do
2. Not interest in the program
3. Others specify_____

VI CONSTRAINTS IN ACCESSING EXTENSION SERVICE BY WOMEN FARMERS

52. Have you ever utilized any extension packages last year? 1= Yes 0= No

53. If yes, indicate the package that you have used below in the table.

SN	Extension program & services provided	Package utilized ✪	SN	54. Reason for not utilized ♣	♣ Alternative reason for not utilizing
53.1	Crop package		54.1		1. Unavailability of input 2. Lack of money (cash) 3. Lack of down payment 4. Unable to repay the previous loan. 5. Lack of labour 6. Lack of interest to participate 7. High input cost 8. Lack of credit 9. Extension package is tedious 10. It is not profitable 11. Shortage of land 12. No extension contact 13. Lack of knowledge 14. Lack of guidance by DA 15. If others (specify)
53.2	Coffee package		54.2		
53.3	Horticulture		54.3		
53.4	Dairy package		54.4		
53.5	Fattening		54.5		
53.6	Poultry		54.6		

✪ Package Utilized: 1= yes 0= No

55. If you have access to credit, have you ever faced any constraints on access of credit?

1= Yes 0= No

56. If yes, what is/are the main constraint(s)?

1. Unavailable on time
2. Unable to remit down payment
3. Lack of credit
4. Lack of collateral
5. High interest rate
6. If other specify_____

57. What was the repayment period of credit you have taken?

1= Short term 2= Medium term 3= Long term

58. Have you ever faced constraints on access to package inputs (improved dairy cattle)?

1= Yes 0= No

59. If yes, what is/are the main constraint(s)?

1. Poor quality of breed
2. Insufficient delivery
3. Unavailable on time
4. Source from far distance
5. Less Extension support
6. If other specify_____

60. Have you ever faced problems in contact with development agent?

1= Yes 0= No

61. If yes, what is the main problem?

1. Lack of credibility
2. Poor technical know how of DAs
3. Lack of interest to support farmers
4. Farmer selection biases
5. If other specify _____

62. Have you ever faced problem on participation of farmer organization (cooperatives)?

1= Yes 0= No

63. If yes, what is the main problem?

1. Lack of credibility in the past organization
2. Lack of money
3. Lack of in interest
4. Corruption
5. Poor capital progress
6. If other, specify_____

64. Have you ever faced with constraints on access of market?

1= Yes 0= No

65. If yes, what is/are the main constraint(s)?

1. Unable to get market in formation
2. Far distant of market place
3. Unable to get alternative market
4. Lack of transportation
5. High market tax
6. If other, specify_____

VII INFORMATION EXCHANGE AND ACTORS

66. Information source and its use pattern:

(Indicate how frequently you use the following sources to get information on dairy farming)

SN	Information source	Frequency of use		
		Always (2)	**Sometimes (1)**	**Never (0)**
1	MOA Office			
2	NGOs existing in the area			
3	Farmers' cooperatives			
4	Peasant associations			
5	Agricultural Development Agents			
6	Neighbors/Friends			
7	Religious institutions			
8	Other farmers			
9	Input supplier organizations			
10	Training, Demonstration & Field days			
11	Leaflets and Folders			
12	Rural radio program			
13	Others (specify)			

67. Importance of the information source:

(Indicate how you perceive the importance of the following sources to get information on dairy farming)

SN	Information source	Importance		
		Very important (2)	**Somewhat important (1)**	**Not important (0)**
1	MOA Office			
2	NGOs existing in the area			
3	Farmers' cooperatives			
4	Peasant associations			
5	Agricultural Development Agents			
6	Neighbors/Friends			
7	Religious institutions			
8	Other farmers			
9	Input supplier organizations			
10	Training, Demonstration & Field days			
11	Leaflets and Folders			
12	Rural radio program			
13	Others (specify)			

68. Closeness of information source:

(Indicate how close to you the following sources to get information on dairy farming)

SN	**Information source**	**Closeness**		
		Very close (2)	**Somewhat close (1)**	**Not close (0)**
1	MOA Office			
2	NGOs existing in the area			
3	Farmers' cooperatives			
4	Peasant associations			
5	Agricultural Development Agents			
6	Neighbors/Friends			
7	Religious institutions			
8	Other farmers			
9	Input supplier organizations			
10	Training, Demonstration & Field days			
11	Leaflets and Folders			
12	Rural radio program			
13	Others (specify)			

69. Value of information

(Indicate how much valuable is the information from the following sources)

SN	Information source	Perceived value for information obtained		
		Very valuable (2)	**Somewhat valuable (1)**	**Not valuable (0)**
1	MOA Office			
2	NGOs existing in the area			
3	Farmers' cooperatives			
4	Peasant associations			
5	Agricultural Development Agents			
6	Neighbors/Friends			
7	Religious institutions			
8	Other farmers			
9	Input supplier organizations			
10	Training, Demonstration & Field days			
11	Leaflets and Folders			
12	Rural radio program			
13	Others (specify)			

70. Knowledge test of dairy farming practices

SN	Knowledge of dairy farming practices	Measurement score
70.1	Name important dairy animals recommended in your area	Nil = 0 One = 1 Two = 2
70.2	What is the daily maximum milk yield of Holstein Friesian breed	Wrong = 0 Right = 1
70.3	Two way of conserve forage feed crops	Nil = 0 One = 1 Two = 2
70.4	Name improved forage varieties recommended in your area	Nil = 0 One = 1 Two = 2 Three = 3
70.5	Name the components of improved cattle housing	Nil = 0 One = 1 Two = 2 Three = 3 Four= 4
70.6	Mention the advantage of Artificial insemination over Bull service	Wrong = 0 Right = 1
70.7	Mention the advantage of Vaccination	Nil = 0 One = 1 Two = 2 Three = 3
70.8	What are the two methods of improving the edibility of crop residue such as hay, straw, etc.	Nil = 0 One = 1 Two = 2
70.9	For how long a new born calf should feed colostrums?	Wrong = 0 Right = 1
70.10	Mention at least two factors that can delay the length of heat period of a cow	Nil = 0 One = 1 Two = 2 Three = 3
70.11	What are the major disease transmitting ways? Mention at least four	Nil = 0 One = 1 Two = 2 Three = 3 Four= 4
70.12	The subsequent control measures of internal parasites affecting dairy cattle	Nil = 0 One = 1 Two = 2 Three = 3 Four= 4

Appendix II The MLR Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.646(a)	.417	.411	3.350
2	.726(b)	.527	.516	3.035
3	.785(c)	.616	.602	2.753
4	.822(d)	.675	.660	2.546
5	.837(e)	.701	.683	2.456
6	.846(f)	.716	.695	2.408
7	.855(g)	.730	.707	2.360

a Predictors: (Constant), communication skills
b Predictors: (Constant), communication skills, interpersonal trust
c Predictors: (Constant), communication skills, interpersonal trust, social participation
d Predictors: (Constant), communication skills, interpersonal trust, social participation, total annual income in Birr
e Predictors: (Constant), communication skills, interpersonal trust, social participation, total annual income in Birr, extension participation
f Predictors: (Constant), communication skills, interpersonal trust, social participation, total annual income in Birr, extension participation, empathy of respondent
g Predictors: (Constant), communication skills, interpersonal trust, social participation, total annual income in Birr, extension participation, empathy of respondent, access to credit

Appendix III ANOVA Table

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	707.188	1	707.188	63.007	.000(a)
	Residual	987.712	88	11.224		
	Total	1694.900	89			
2	Regression	893.722	2	446.861	48.525	.000(b)
	Residual	801.178	87	9.209		
	Total	1694.900	89			
3	Regression	1043.306	3	347.769	45.900	.000(c)
	Residual	651.594	86	7.577		
	Total	1694.900	89			
4	Regression	1143.978	4	285.994	44.125	.000(d)
	Residual	550.922	85	6.481		
	Total	1694.900	89			
5	Regression	1188.417	5	237.683	39.420	.000(e)
	Residual	506.483	84	6.030		
	Total	1694.900	89			
6	Regression	1213.510	6	202.252	34.872	.000(f)
	Residual	481.390	83	5.800		
	Total	1694.900	89			
7	Regression	1238.032	7	176.862	31.744	.000(g)
	Residual	456.868	82	5.572		
	Total	1694.900	89			

Predictors: (Constant), communication skills

b Predictors: (Constant), communication skills, interpersonal trust

c Predictors: (Constant), communication skills, interpersonal trust, social participation

d Predictors: (Constant), communication skills, interpersonal trust, social participation, total annual income in Birr

e Predictors: (Constant), communication skills, interpersonal trust, social participation, total annual income in Birr, extension participation

f Predictors: (Constant), communication skills, interpersonal trust, social participation, total annual income in Birr, extension participation, empathy of respondent

g Predictors: (Constant), communication skills, interpersonal trust, social participation, total annual income in Birr, extension participation, empathy of respondent, access to credit

h Dependent Variable: respondents knowledge of dairy farming

Appendix IV The multiple correlation coefficients

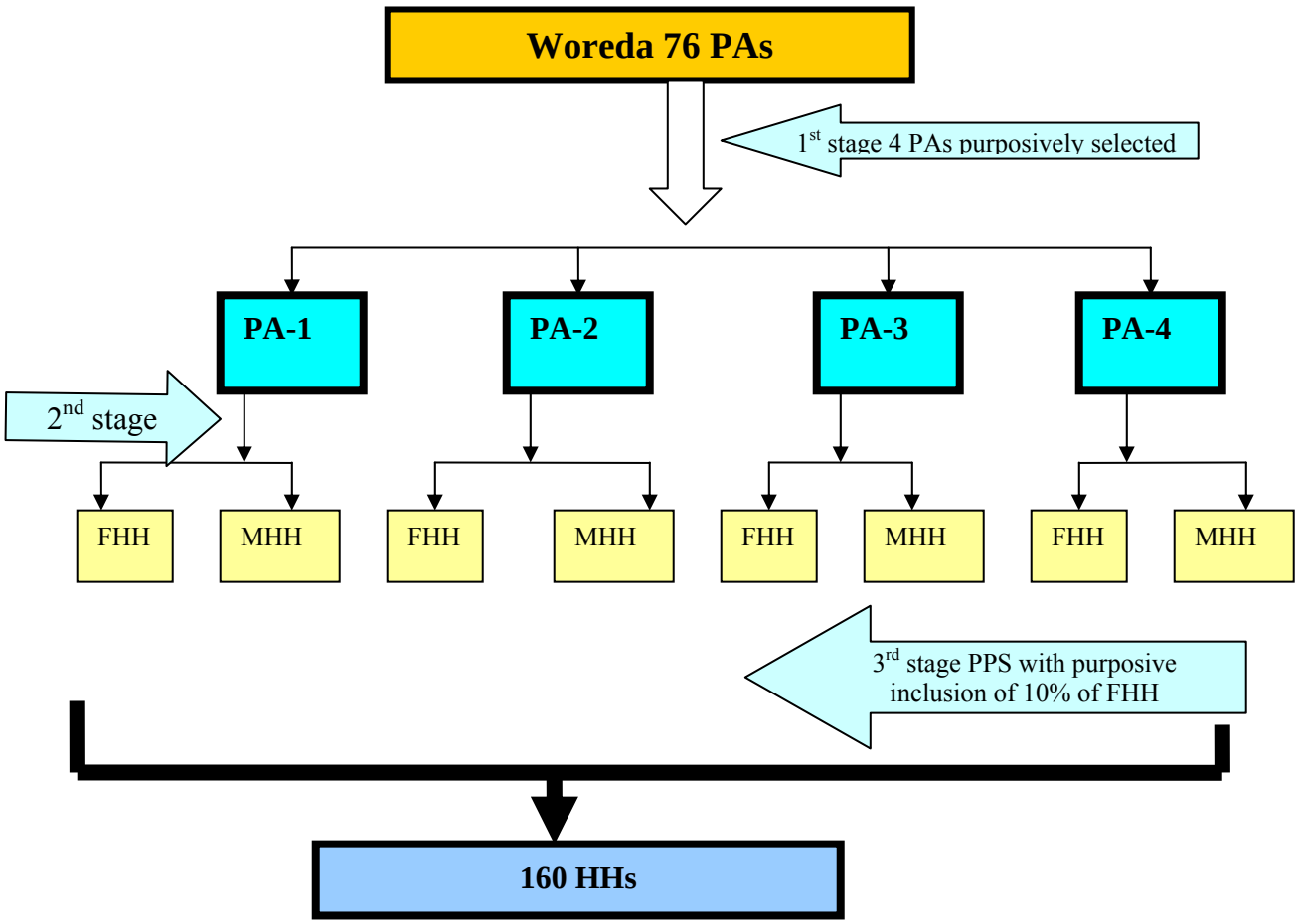
Model	Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
7	(Constant)	-3.761	1.093		-3.441	.001
	Communication skills	.194	.046	.305	4.213	.000
	Interpersonal trust	.791	.196	.300	4.028	.000
	Social participation	.132	.046	.200	2.866	.005
	Total annual income in Birr	.000	.000	.177	2.945	.004
	Extension participation	.371	.153	.152	2.427	.017
	Empathy of respondent	.660	.293	.153	2.253	.027
	Access to credit	1.765	.841	.147	2.098	.039

Dependent Variable: respondents knowledge of dairy farming

Appendix V Excluded Variables

Model	Variables	Beta In	t	Sig.	Partial Correlation	Tolerance
7	Sharing of available information with others	.078(g)	1.028	.307	.114	.568
	Size of land holding in hectare	.086(g)	1.345	.182	.148	.790
	Information seeking behavior of respondent	.064(g)	.804	.424	.089	.515
	Positiveness	.067(g)	.838	.404	.093	.520
	Level of aspiration of respondent	-.016(g)	-.260	.796	-.029	.865

g Predictors in the Model: (Constant), communication skills, interpersonal trust, social participation, total annual income in Birr, extension participation, empathy of respondent, access to credit
h Dependent Variable: respondents knowledge of dairy farming



Appendix Figure 1 Sampling technique diagram